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CONSOLIDATION

edited by Franz Fischer, Diego Mantoan, Barbara Tramelli

Consolidation Comes with Practice On Ending a Prime Exploratory Journey in the Digital and Public Humanities

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Diego Mantoan

Barbara Tramelli

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1 Of Parameters Filled with Self-awareness and Some Due Over-enthusiasm

With this second issue of *magazén*'s 2021 volume we are drawing towards the end of a research journey, which involved dozens of international scholars mutually pondering what kind of methodological consolidation was in sight for the wider and heterogeneous field of digital and public humanities after more than two decades in the making. Browsing through the papers of both issues of the current volume, we are under the impression that the scholarly community globally operating in this varied domain demonstrates a scientific self-awareness such as to make it finally an established sector. Perhaps we are overenthusiastic for the novelties emerging from various research clusters. Or, rather, we are simply underestimating how much it takes to establish a new (inter)disciplinary field at academic level, which of course also comprises the appointment of tenure-track positions and stably funded research centres. However, it is already notable that scholars who are active in the digital and public humanities get on conducting their independent research. This

This introduction paper was mutually agreed on by the Authors who acted as Cura-tors of *magazén*'s volume 2021, divided in two issues, with the help of the Journal's Ed-itorial Board.

becomes evident when looking at the varied range of resources and modes of research conduct, even in the papers collected in this issue, which self-assuredly supersede disciplinary categories and scientific vocabularies to find their own parameters and terms. It may seem obvious, perhaps, but we believe it is relevant to stress this even more: as the six articles of this second issue demonstrate, consolidation of a new domain comes with practice.

Also for the second issue of volume 2021 scholars at different levels of their careers - from PhD candidates to senior researchers and full professors - contributed to our topic, effectively turning *magazén* into an open platform for theoretical debates, methodological reflections, and the analysis of case studies ranging from philology to history, from art history to archaeology, from cultural heritage to the GLAM sector. Keeping up the best possible editorial standards, such as to strengthen our scientific venture, the published papers resulted from a thorough process of selection and vetting. After the international call for proposals, the selected authors underwent double blind peer review and only a third of the received proposals made it to the stage of final publication. This tough selection involved as always a broad set of international reviewers from major universities and research centres, whom we would wholeheartedly thank for their precious time and attention. We sincerely hope that our audience will appreciate the work that lies behind this entire volume, finding high quality and exciting novelties across the published papers.

This year's final issue further comes with the definitive implementation of our new online platform hosted on our publisher's website, Edizioni Ca' Foscari, thus allowing the exploitation of a new set of search tools across all papers published in our journal so far. In fact, we propose a categorisation of analytical purpose based on five core domains useful as cross-referential pillars in the digital and public humanities, being materials, media, methods, sharing modes and involved actors/factors. On top of this, the second issue of volume 2021 also opens with a special feature section comprising a guest contribution by a renowned scholar, which this time is devoted to a specification of the peculiar name we have given ourselves. For this reason we are very honoured to include the invited paper by Lorenzo Tomasin embarking on a methodological quest relevant to the digital and public humanities, starting with the term '*magazén*'.

2 Another Set of Contributions for the Purpose of Consolidation

The contributors chosen for the second issue of volume 2021 explore the concept of consolidation by putting into practice a range of methodological perspectives tailored on specific case studies, presenting the audience with different takes on how to conduct research in the evolving domain of digital and public humanities.

To begin with the first contribution, Lorenzo Tomasin presents the VEV project (*Vocabolario storico-etimologico del veneziano*) through a fascinating excursus of the origin and meaning of the word *magazen*, which dates back to the fourteenth century: we discover that the earliest known Venetian attestations of this word are among the earliest ever in a Romance language, and that 'magazenos' are already mentioned in a pact signed in 1302 between Venice and the sultan Melech Nasser, king of Egypt. In the second essay, Gamze Saygi and Marie Yasunaga focus on the case study of the biggest lost city of the premodern world, Edo (present-day Tokyo), enquiring on its street life using a hybrid model that combines 3D visualisations and 2D mapping, with the aim of retrieving what the real street life of the city would have been like.

In the third contribution of this issue, Yael Dekel and Itay Marienberg-Milikowky demonstrate how computer-based analysis of different readings carried out by many readers can produce a relatively minute picture. Taking the Hebrew novel as case study, since its emergence in 1853, the research reflects on the conceptual benefits, as well as the limits, of public distance reading.

Paola Moscati, in the fourth essay, explores the interdisciplinary turn observed in the development of digital archaeology through a number of archaeological case studies pivoting around the Etruscan civilisation. In doing so, she shows to the reader how digital developments - GIS and multimedia systems - create a unitary platform on which methods and practices of data acquisition, analysis, interpretation, and communication can converge.

Coming to the two final essays, Simone Fagioli introduces us to the subject of the automatic colouring in photography, presenting data and experimental results with original examples of automatic colourisation applied to anthropological images, reflecting on its use for the extraction of different pieces of information.

Finally, Petros Apostolopoulos in his reflection on Public History, explores the historiography of the discipline focusing on the concept of the 'public', as it appeared in the historiographical production and debates of the United States. He presents the development of this concept over time, an analysis that proves particularly relevant to understand the future of the discipline itself.

We wish to thank all the Authors of this issue, who presented different compelling case studies, theoretical debates and methodo-

logical reflections with the aim of carrying further the discussion on the nature and developments of the different facets of the Digital and Public Humanities.

At the very last, but not least, we wish to thank all experts and scholars involved in this year's journey: our Advisory Board members, the generous peer reviewers, our tireless editorial board members and the very efficient team of our publisher. Looking forward to next year's volume, which will be devoted to the topic of '[re]constructions', we hope that 2022 will offer us the chance to overcome the pandemic for good.

Magazen: History of a Word Told Through a Project of Digital Lexicography

Lorenzo Tomasin

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Abstract The paper presents the general structure of the research project *Vocabolario storico-etimologico del veneziano* (VEV), funded by the Swiss National Fund, and in particular the entry *magazén*, a word of Arabic origin, whose etymology and history are described in order to explain its widespread diffusion in the European languages and its peculiar semantic trajectory (from ‘storage’ to ‘wineshop’, in Venetian, and through the French word *magasin*, probably borrowed from Italian, to English and Global magazine ‘newspaper’).

Keywords Venetian dialect. Etymology. Digital lexicography. Arab words in Romance.

Summary 1 Gazettes and Magazines: from Eastern Mediterranean Languages to Global English (through Venice). – 2 On the Word *magazén*. – 3 An Etymological Dictionary in the twenty-first century, Between Tradition and Digital Innovation.



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1 **Gazettes and Magazines: from Eastern Mediterranean Languages to Global English (through Venice)**

What we now call Venetian dialect has played, throughout its history, the function of a crossroads for many words of exotic origin that have settled not only in Italian, but also in various other European languages. As a *bridge language* due to the cultural, economic, and political function Venice had for centuries in the relations between East and West, Venetian has a great importance in the mediation of Greek and Arabic words, some of which destined to particular fortunes also in areas remote from the commercial or seafaring ones in which contact or exchange originally takes place.

An eloquent example is offered by two lexemes which, in Italian and English but also in many other cultural languages, are among the most commonly used words to indicate the periodical press: *gazzette* and *magazine*, the latter affirmed in the meaning ‘journal’ in the English context, and returned with this meaning to various European languages, which have welcomed it as more or less adapted Anglicism. Both words originate in the eastern Mediterranean and migrate into the languages of Western Europe, also passing through Venetian, which is indeed one of the most probable vectors.

Mario Infelise (2016; 2017), a distinguished historian of Venetian printing press, has already dealt with the history of the word *gazzetta*, reconstructing the path through which the Greek name of the *crazia* (small coin minted in Venice at the end of fifteenth century to circulate in the Greek islands of the *Dominio da mar*) passed to indicate the printed sheets containing news of various kinds which, in the course of the Modern Age, progressively evolve towards what we now call *newspapers*. The word *gazzetta*, in short, is actually a Venetian word transmitted into Italian, and from there into other European languages, such as German and, crucially, English, which is particularly exemplary; it was therefore among the first to be considered in the frame of the lexicographical project, co-directed by the writer, of the *Vocabolario storico-etimologico del veneziano* (VEV).¹

Only partially similar is the case of the Venetian word *magazen*, chosen as the title of the journal in which these pages are published due to its semantic allusiveness, which refers on the one hand to the meaning – typically Venetian – of ‘public place, point of sale’ (especially of wines), and on the other hand to the meaning – radiated from

¹ The entry *gazeta* of the VEV has been published in Tomasin, D’Onghia 2020, 81. By the way, this word has been recently re-semanticized in the field of Digital Humanities (and Digital Cartography in particular) thanks to the so-called *digital gazetteer*: see for instance the project lead by Andrea Nanetti, *Engineering Historical Memory* (<https://engineeringhistoricalmemory.com/>).

English - of 'periodic publication' (on the choice of this name, see Fischer, Mantoan, Tramelli 2020, 9).

It seemed almost inevitable to pay homage to this choice by publishing here, in the appendix, the article *magazen* of the VEV, and proposing some consideration on the digital side of the project, which represents the intersection area between the VEV and the scientific interests of the Venice Center for Digital and Public Humanities.

2 On the Word *magazén*

Some more hints about the word *magazén*, to illustrate the entry published in the appendix drawn up according to the criteria established for the dictionary: that is, based on the review of the occurrences of the word in a corpus of texts constituted as follows:

- a. for the ancient part (up to the end of the fourteenth century), the Venetian sub-corpus of the database in service of the *Tesoro della lingua italiana delle Origini* (*TLIO*) of the Istituto Opera del Vocabolario Italiano of the CNR of Florence. The *TLIO* is a database of ancient Italian texts that can be interrogated using a software (Gatto) created within the same institute and accessible through an online platform (vevweb.ovvi.cnr.it). Thanks to the preventive lemmatisation of most of the texts inserted, not only combined searches are possible in the corpus, but also searches for lemmas, which take the (Italian) lemmatory of the *TLIO* as a reference point;
- b. for the modern and contemporary part (fifteenth-twentyfirst centuries), about a hundred digitally acquired dictionaries, lexicons and glossaries (specifically: a library of files mostly in PDF format obtained by scanning volumes or parts of volumes of lexicographical interest with OCR) that are queried in a way that we could define semi-automatic, that is, both by using the normal search functions, and by means of punctual checks and controls on the digitised text;
- c. ancillary, to cover the gaps in the two previous corpora, a selected library of post-medieval texts written in Venetian, that represent the long tradition of Venetian dialect literature, which proved to be particularly useful for documenting the phases of Venetian less covered by the very rich lexicographic production relating to the Venetian;
- d. finally, as a further complement, the extensive scientific bibliography (in particular historical-lexical and etymological) produced by nineteenth/twentieth-century dialectology and concerning Venetian.

This is not the place to illustrate in more detail the structure and content of the corpora listed above, which have already been presented in various papers (D'Onghia, Tomasin 2019; 2021).

In the case of *magazen*, the examination of the materials obtainable from the overall testimonial thus allows us to reconstruct the Venetian history and diffusion of an Arabism (مخزن *mahzan* 'deposit': Pellegrini 1972, 104-5) which, as in other similar cases, is adapted almost simultaneously to medieval Latin and to more than one of the Romance languages that came into contact with Arabic in the East (akin to the case of a semantically similar and also Arabic word, *fondaco*, in Venetian *fontego*).

The earliest known Venetian attestations are among the earliest ever in a Romance language: thus, *magazenos* available to Venetians are mentioned in a pact - drafted in Latin, but obviously saturated with vulgarisms like all similar texts of this era - signed in 1302 between Venice and the sultan Melech Nasser, king of Egypt; and again, this time in the vernacular, a long report written in 1306 by the Venetian merchant Marco Michiel, and relating to the troubles he experienced in Cyprus, speaks of *magaçeni* of the king of Cyprus, with ç equivalent to z as usual (Tomasin 2013, 40).

In the first decade of the fourteenth century, therefore, *magazen* is a word sufficiently clear and integrated in the Venetian commercial language to be used several times both in texts written in Latin concerning the relations with the Arabs, and in vernacular texts certainly written by Venetians.

Another Romance language, namely Spanish, had previously imported the same Arabic lexeme: it is the word *almacén* (characterised, as often in that language, by the agglutinated Arabic article: DCECH, s.v.), documented as early as 1225 and corresponding to the same word *mahzan*, but destined to a much lesser success than the 'sister' *magazen*. In fact, even the Pisans - travelling companions and often rivals of the Venetians in the ports of the near East - in the same years had integrated the same entry into their commercial lexicon, so much so that the word *magazeno* also occurs in a Pisan document about the port of Cagliari written in 1318. Nor is it surprising to find a *magazenu* also in the Messinese translation (a *volgarizzamento*) of Valerio Massimo, drawn up between the twenties and thirties of the same century by Accurso da Cremona (TLIO, s.v. "magazzino"). And again in medieval Sardinia, the lexeme appears in the form *mazzen*, influenced by the Catalan *maatzem*, *matçem* (FEW 19, 115). And notwithstanding the early attestations in the sources in French, it is probable that, precisely in Italo-Romance commercial circles (and among the Venetians in particular), the term was adapted to the French language (Arveiller 2012, 361).

What is important to underline here is that the word in question, with a tonic vowel concordantly rendered as *e* by all the Italo-Ro-

mance varieties that adapt it in the fourteenth century (more recent is *magazzino* type with *i*, probably triggered by the combination of the Italian suffix *-ino*), appears to be documented in Venice earlier and more abundantly than in other Italian cities, which makes it entirely plausible that the Venetian mercantile environments are the ones from which the term radiated at least in the Italian context.

A further clue about the antiquity and vitality of the Venetian word *magazen* consists in the fact that right in the Lagoon it experiences a more complex semantic evolution than elsewhere. The development of the meaning of ‘tavern’ is peculiarly Venetian and vital and documented starting from the sixteenth century (but certainly earlier) and keeping vital at least in the sticky lexicographic tradition, until the last century (its decline may have been favoured by the success, precisely from the twentieth century and still current, of the synonymous *bàcaro*).

We are informed about the Venetian *magazzen* ‘tavern’, in its typical eighteenth-century meaning, by Francesco Zorzi Muazzo, an extravagant Venetian lexicographer active between the sixties and seventies of the eighteenth century and author of a *Raccolta de’ proverbi, detti, sentenze, parole e frasi veneziane, arricchita dalcuni esempi ed istorielle*, a sort of monolingual Venetian paleo-dictionary (for its historical and linguistic importance see D’Onghia, forthcoming). Here is the passage relating to wine warehouses, also called bastions (ed. Crevatin 2008, 90):

Magazzen da vini. Do principalmente zè i caporioni che fa andar sti bastioni in Venezia: uno zè un tal Zuane Coa, villan da Bovolenta, veggio avaro e sordido che solamente el veder la figura fa ricavar cosa che de baronae, ladrarie e struzio della povertà vien fatte dai so omeni nei so bastioni che va a conto soo e che par tante spelonche de ladri e sassini quei so bastioni; l’altra zè la fameggia dei Coletti, onesti e onorati galantomeni, amai dal so Prencipe, dalla nobiltà e dalla povertà massime e che procura che a tutti ghe vegna dà el so giusto.

Magazzen for wine. The merchants who run these shops in Venice are two: one is Zuane Coa, a farmer from Bovolenta, a miser and dirty old man. Just to look at him, he brings to mind the crimes committed by his men against the poor in his warehouses, which seem like dens of brigands and murderers. The other is the Coletti family, honest and honoured gentlemen, loved by the Doge, the nobles and even the poors, and who behave very correctly with everyone.

3 An Etymological Dictionary in the Twenty-First Century, Between Tradition and Digital Innovation

The use of IT tools (in particular the digital libraries mentioned above) is already important in the preparatory phase of the VEV materials, and it becomes crucial in other phases of the lexicographical process. The VEV project envisages, as usual in the field of research lexicography, a complete online publishing of its entries, i.e. the progressive upload in a website created by Salvatore Arcidiacono: <http://vev.ovr.cnri.it>. The site is modelled on similar recent initiatives, and in particular on digital dictionaries created by the Istituto Opera del Vocabolario Italiano of the CNR of Florence, which hosts the digital platform of the VEV: see for instance the *Tesoro della lingua italiana delle origini* (<http://tlio.ovr.cnri.it>) and the more recent *Vocabolario dantesco* (<http://www.vocabolariodantesco.it/>; see Arcidiacono 2020). In all these online dictionaries, entries are structured in a series of tabs, each corresponding to a fixed section, such as the phonomorphological variants, First attestation, Etymological notice, *Note* in which the problems and particularities of the single item are discussed.

It is almost useless to specify that the choice of an online dictionary allows the VEV to progressively present the results of its research (not necessarily having to publish the items in alphabetical order), and to correct the items already published. These are all too well known and obvious advantages, which, however, were not enough – in our case – to definitively discourage the parallel design of products made in the traditional paper form (accompanied, of course, by the open access publication of the volumes in PDF format).

Thus, starting from the autumn of 2020, a series of thematic volumes (*Parole veneziane*) began to be released by the Lineadacqua publishing house in Venice: one hundred at a time, groups of thematically related words are published *on paper*. After the Venetianisms of Italian (subject, together with the first entries of letter A, of the volume *Parole veneziane*, vol. 1, Tomasin, D'Onghia 2020), it was the turn of the insults (*Parole veneziane 2. Ingiurie improperi, contumelie*: Panontin 2021), and it will soon be that of the most typical terms of the legal and political system of the Serenissima, the Republic of Venice (Verzi, forthcoming, to be released by the end of the year). Other volumes are planned for games and toys, and others will be dedicated to Venetian architecture, boats, cuisine, and so on.

So why have we chosen the dual and parallel path of online and paper publication of the Dictionary? Let us clear the field of economic issues immediately: the funding obtained from the project – hitherto supported by the Swiss National Research Fund and the Scuola Normale Superiore di Pisa: hopefully other supporters will be added in the future – make the maintenance of both channels financially

sustainable for now. And the production of the volumes printed by Lineadacqua also has a mercantile response – that is concretely: a circulation and a purchase even outside the restricted circle of researchers, which makes them a commercially credible product.

This makes us reflect on the only apparent and unconditional openness ensured by the online publication of products that the less specialised public continues to prefer in more traditionally accessible and differently usable versions, as are the books (the theme, incidentally, seems to us not devoid of interest in the perspective taken today by the so-called Public Humanities).

However, there are further more strictly scientific reasons in favour of the choice to publish the dictionary in the double path of the digital full version on the one hand, and of the partial *excerpta* on the other. In fact, the consultation of the thematic volumes gives the work the possibility of a reasoned use (in the sense that the adjective *ragionato* has in the lexicographic tradition), that is the opening of thematic paths and monographic studies on single portions of the lexicon. A final index is planned for the *Parole Veneziane* series, which will allow to retrieve all the printed entries. It will make a distinct and complementary service to the one offered by the online dictionary, in which everything will be searchable in much more open and *liquid* form. This will make its perusal more suitable for some uses, but less suitable for others. Far from scrapping traditional lexicography, from this point of view, digital lexicography approaches it as a useful complement.

Still, a year of work on the VEV website has already shown that, counter-intuitively, the times and methods of traditional, paper publishing, prove to be more agile and quicker – at least in some phases: of course, the ἐντελέχεια of the dictionary remains the full and open publication of its contents – than those of the on-line dictionary. The latter is requiring a running-in and adaptation period that delays and slows down the possibility of immediately having the items on the telematic platform. In fact, at the moment (Summer 2021), only a hundred items are available on the site, while already two volumes – with about a hundred entries each – have come out and a third is in the works (about a thousand are the entries already ideally stored in the editorial warehouse, that is, already written, albeit at different levels of revision). In short, the computer version of the on-line dictionary is proving to be slower and more cumbersome than the well-proven system of paper publication of mini-dictionaries which, in fact, are the volumes of the series.

Finally, in the laboratory of the online dictionary, it is often necessary to ask oneself about the research possibilities that it makes sense (or does not make sense) to offer to those who consult such a tool, and in some cases arises the problem of the possible realisation – which obviously is automatic and rapid only in the results it

promises, but certainly not in the processes that are used to achieve it - of data reservoirs and related digital tools useful for obtaining quantifications and general statistics about the content of the work. For example: why not equip the VEV with the possibility of automatically extracting the statistics relating to the origin of the etymes of its forms, attributing appropriate labels when loading the entries? Or, why not make it possible with a click to elicit statistical data relative to the number of lemmatised adjectives, to compare them with the amount of verbs or nouns (masculine and feminine) to which an entry is entitled? Or again, why not make available to the user (no longer reader) graphs and statistics that can be obtained transversally with appropriate data entry and the creation of special tools?

Such functions were formerly, albeit more modestly, carried out by the indices of traditional dictionaries, but they have the natural tendency, in the digital environment, to multiply and make more complex objects investigable, sometimes bordering on issues that in the lexicographic research of the past would have been considered peregrine. In addition, the creation of such tools, which are easy and very quick to use once they are ready, requires time and work, and inevitably has repercussions on the procedures for editing and loading properly lexicographical materials.

The belief of the coordinators of the VEV project - who can benefit from the continuous and close comparison with the progressively printed paper volumes - is that the quantity and complexity of such digital equipment should be reduced to a minimum in the dictionary construction phase. In other words, what is available in the products of the great etymological tradition of the last two centuries must continue to be accessible in the new products of digital lexicography and must aim at the same levels of scientific (i.e. strictly *linguistic*) quality. It is on the basis of soberly but precisely indexed repertoires such as traditional etymological dictionaries that it has been possible to construct almost everything we know about the lexical history of the languages. The lexicographical frame defined by the works of a tradition already consolidated at the end of the nineteenth century constitutes the minimum lexicographic requirement that makes any language a lexicographically and etymologically well described language. What remains to investigate in our case - and in general, maybe, in the field of the digital lexicography applied to Romance linguistics - is whether the digital format can offer new possibilities and new perspective to enrich, to strengthen and to make more complex the lexicographical research. The light structure chosen to develop our project leaves those horizons open to further exploration.

In fact, what derives from the computer processing of these materials and from the devising of new tools of consultation or quantitative, statistical and in any case automated investigation of the available data represents a welcome complement but they actually do not

slow down or hinder the work of the etymologist, whose scientific agenda remains essentially unchanged. It is basically on the goodness of the etymological hypotheses, on the completeness and correctness of historical reconstructions, on the clarity and order of the expositions that it makes sense to evaluate the work of those who, being historical linguist, is unable to consider the development of a software or the exploration of new IT territories as a scientific objective.

The example of a great romance etymological dictionary such as the *Französisches Etymologisches Wörterbuch* (FEW), first and entirely made in traditional form, and then *de facto* digitalised in an excellent website (<http://lecteur-few.atilf.fr>), shows the ideal path of a work that has posed its author - a linguist - exclusively linguistic concerns (resulting in a masterpiece of etymology and historical linguistics) and has left to its followers the interesting IT challenges that make it a tool today easily and profitably available also in its online version.

The more bumpy path of other similar lexicographical projects, such as that of the *Lessico etimologico italiano* (LEI), born in the traditional form and transferred in the course of work on IT support, shows how the transition must face with significant executive problems (Prifti 2020).

Not to mention, of course, that all the great dictionaries printed in European history, starting at least from the *Crusca* of 1612 (today retro-digitised!) can still be read on the original pages at any time, without any digital accident temporarily obscuring (or, God forbid, making it permanently inaccessible) their fragile digital content, in need of continuous technical updates. In a field, such as Humanities, in which the scientific bibliography survives decades and sometimes centuries, this does not seem an insignificant detail.

Appendix. The Entry *magazen* of the VEV

(As for references to the corpus and for the meaning of the few conventional abbreviations, see the VEV website, <http://vev.ovl.cnr.it>).

magazen (magasen, magazzen, magazzeno, magasin, magazin, masaghen)

1. s.m. ‘deposito per le merci’.

■ *Corpus VEV*: 1306 Doc. venez. (4).

XIV SellaVen (mediolat. *magazenus*, *magazinus*); 1374-1434 *Codicemorosini* 209, 210, 882 etc.; 1436 *CapitolareTernieri* 28; 1436-1440 *BadoerGloss* 84; 1463 *FoscariViaggi* 90; 1475-1505 *CapitolareVisdomini* 60, 76; 1483 *SanudoItinerario* 32; 1485 *ZorziDispacci* 49; 1496-1532 *SanudoDiarrii* 1.135-57.267 (m., *magazzen*); 1537-1582 *Concina* (m., *magazzeno*); 1548-1613 *CortelazzoXVI*; 1684 *Volpe* 19, 20; 1732-1779 *FolenaGoldoni* (m., *magazzen*, *magazzin*); 1767-1775 *Muazzo* 90, 91, 148 etc. (m., *magazzen*); 1775 1796 1821 *Patriarchi* (*magazzen*); 1829 1856 *Boerio*; 1851 *Paoletti*; 1876 *Nazari*; 1922 *Rosman* (*magasen*, *magasin*, *masaghen*); 1935 *Michelagnoli*; 1982 *Nàccari-Boscolo* (*magasen*); 1987 *Doria* (*magazin*); 2007 *Siega-Brugnera-Lenarda*.

► locuz.

- *capo da (del) m.* ‘sottocapo’ 1767-1775 *Muazzo* 205, 227, 235 etc.; «primo servente, ed è quello preposto alla cantina d'un magazzino di vino» 1829 1856 *Boerio*.
- *far m.* ‘adunare insieme’ 1829 1856 *Boerio*.
- *m. dale croste* «se dise alla gola e alla pansa» 1767-1775 *Muazzo* 172.

2. s.m. ‘taverna, osteria’ (spesso *m. da vin*).

1545-1584 *CortelazzoXVI* (*m. da vin*); 1671 *VarotariVespaio* 135; 1675 *BalbiLigamatti* 34; 1688 *BonicelliBullo* 28, 29, 37; 1693 *MondiniPantalone* 77; 1732-1779 *FolenaGoldoni*; 1767-1775 *Muazzo* 90, 113, 122 etc. (*m. da vini*, *da vin*); 1829 1856 *Boerio* (*m. da vin*); 1851 *Paoletti*; 1852 *Contarini* (*m. da vin*); 1888 *Contarini-Malamani* (*m. da vin*); 1928 *Piccio* (*m. da vin*).

► der./comp.

- *imagasenare* v. ‘mettere in magazzino’ 1982 Nàccari-Boscolo.
- *magazenagio* s.m. ‘immagazzinamento’ 1829 1856 Boerio; 1851 Paoletti.
- *magazenetto* dim. 1767-1775 Muazzo 286.
- *magaz(z)enier* s.m. ‘magazziniere’, ‘oste’ XVII *Bonicelli Spezier* 78; 1688 *BonicelliBullo* 36, 40, 44 etc.; 1767-1775 Muazzo 159 (*magazz-*); 1829 1856 Boerio; 1851 Paoletti; 1852 Contarini; 1875 *PiccoloCarena* 12 (s.v. *taverna*: «venez. *m. de vin*»); 1876 Nazari; 1888 Contarini-Malamani; 1935 Michelagnoli.
- *maga* s.m., forma abbreviata di *m.*, usata nell'espressione ger-gale dei barcaioli *andar al maga* ‘andare a bere’ 1829 1856 Boerio (s.v. *maga*).
- *magaz(z)eniera* s.f. ‘ostessa’ 1767-1775 Muazzo 541; 1829 1856 Boerio; 1851 Paoletti.

◎ Le occ. veneziane più antiche sono anteriori alla prima segnalata dal TLIO s.v. *magazzino* (Pisa 1318); l'occ. più antica segnalata dal DELIN (s.v. *magazzino*) proviene dal latino medievale di Curzola (1214).

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The Digital Urban Experience of a Lost City

Using Mixed Methods to Depict the Historical Street Life of Edo/Tokyo

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Abstract This paper digitally reconstructs street life in Edo (present-day Tokyo), the largest lost city of the pre-modern world. The ephemeral character of the Edo makes the historic urban experience extremely difficult to capture. We argue that the hypothetical digital reconstructions should incorporate evidence on human agency and spatial properties for a holistic simulation of historic street life. We develop a 3D hypothetical reconstruction based on multi-layered historical evidence to unlock the lost character of the Edo streets. It reveals the streets of Edo, including the rhythms of everyday life and the impact of the material culture.

Keywords Urban history. Everyday life. Space-use. Pre-modern Japan. Streetscape. Digital past. Virtual reconstruction. 3D modelling.

Summary 1 Introduction. – 2 A Global Perspective on the Role of the ‘Digital’ for the Discovery of Historical Street Life. – 3 The Digital Attempts to Reconstruct the Pre-Modern Urban Space of Edo. – 4 The Case of Edo: Urban Form, Dwellers, and Street Life. – 5 A Digital Reconstruction of the Lost Streets of Edo at the Turn of the Nineteenth Century. – 6 Results and discussion. – 7 Conclusion and Future Work.



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1 Introduction

The character of urban spaces has often been labelled via sets of terms such as public/private, open/semi-open/closed and indoor/transit/outdoor space. These distinctions have long been blurred when defining pre-modern streets as urban spaces due to the pluralistic dynamics of street life. As the governance of streets and squares are shaped by a combination of everyday use and physicality, the space of the street can only be investigated via a joint exploration of practices and materiality.

The use of digital visualisations is not new for historical research involving analysis of large quantities of unstructured historical data in two-dimensional (2D) space, and the extensive use of digital tools and strategies have long contributed to an enhanced understanding of the dynamics of urban space in pre-modern cities. The Geographical Information Systems (GIS), known also in the field as historical GIS, has allowed greater insights into the patterns of street use and has furthered understanding of the physical culture of the city in all aspects deemed imperative in shaping the way agents behave in physical space. A broad range of applications in the form of digital three-dimensional (3D) reconstructions has also begun to give way to an authentic, immersive urban experience of the past. Nevertheless, studies focusing on 3D reconstructions have disproportionately concentrated on the material culture of historic streets and have based their hypotheses on photographic or material evidence in particular. In fact, 3D reconstructions can also play an important role in providing insights into the spatial dynamics of long-lost streets despite the lack of material evidence. They can support historians' explorations of the relationship between the built environment and individuals, although current digital applications have scarcely begun to bring this connection forward.

The streets of pre-modern Edo, before the city's transition into Tokyo as we have come to know it today, provide an excellent yet challenging case to pursue the possibilities of such a blended digital approach: the ephemerality of its built environment and the scarcity of extant historical testimonies – whether in the form of textual, physical, or visual evidence – inevitably requires the sort of cross-disci-

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plinary study we propose. This paper thus attempts to digitally hypothesise facets of material and immaterial culture alike so as to uncover the richness of the long-lost street life of Nihonbashi in the city of Edo. It offers a 3D reconstruction of a street space that provides a revealing snapshot of everyday life in Edo, and it showcases a dramatically different kind of urban scenery than we see today. This area was witnessing rapid urbanisation; it reveals the drawbacks of a Golden Age and indicates a rise in culture.

2 A Global Perspective on the Role of the ‘Digital’ for the Discovery of Historical Street Life

When investigating historical street life, a key problem concerns adding the perspective of space and human agency together in order to uncover everyday urban space-use, social activity patterns, and mobility. In historical research, the relationship of human agency and the built environment plays a crucial role, but it rarely takes centre stage in digital methods. Only a limited body of studies address this essential issue, and current research is dominated by a 2D mapping approach, typically in the form of historic datasets projected onto maps of urban space. Such an approach has confirmed its considerable capacity when research is focused on the densities of agents' use of urban space or on changes in street and block densities (Noizet 2020), or has engaged in reconstructing vanished streetscape patterns in 2D space (Page, Ross 2015), to cite a few of many examples. Certain other scholars tend to address the spatial analysis of historical urban street networks using space syntax and investigate the relationship between urban space and urban life. This method has been followed by the integration of the space-syntax approach with GIS, enabling a wider analysis of street use to decipher accessibility, visibility and networks in the service of advancing historians' interpretation of urban life itself (Griffiths, Vaughan 2020). The drawback of these studies is in their representation capability: bounded in 2D space, they lack the vertical dimension that is required to fully decipher historical street use.

Stepping beyond the horizontal representation in 2D space is especially important when unlocking the relationship between buildings and the street, and its effects on the form assumed by street life. A relevant major advance is the Time Machine Project, which coined the concept of a four-dimensional (4D) world for historical urban space. Here the 3D model has been complemented by a conception of time, placing the formation of a digital information system on the horizon and underlining the value of recreating cities as they were in the past. “The Advent of the 4D Mirror World” (Kaplan, Di Lenardo 2020) ambitiously aims to provide a search engine for access to information about historical places and human agency, and has begun to

show its capacities with regard to certain historical European cityscapes such as in Dresden (Münster et al. 2020). From the urban perspective, the 3D/4D modelling approach of a historical urban section requires 3D documentation from reality (Devaux et al. 2018), 3D modelling based on historical sources (Chevrier 2016) or the combination of both (Rodríguez-Gonzálvez et al. 2019). Amongst these approaches, 3D modelling from reality has received significant attention and yielded highly accurate, even photo-realistic representations of historical urban environments. Nonetheless, such an approach is only possible when evidence of historical stratification exists as physical traces. In fact, the material culture of a particular locale might be utterly vanished due to changes (planned and unplanned) attributable to natural or human-made causes that have brought forth physical surroundings that differ from what historical agents experienced in the past. This calls into question the applicability of reality-based or mixed 3D reconstruction methodologies when hypothesizing ephemeral urban sections such as the long-lost streets of Edo, where extant material culture is utterly lacking. Such instances draw attention to the importance of source-based methodologies.

The topic of historical streets has also begun to draw attention from researchers working with machine learning algorithms. Google Artificial Intelligence Research attempts to provide a Google Street View experience of historical urban space through the use of deep learning and crowdsourcing in its work on the recreation of historical Manhattan streetscapes in 3D (Kiveris 2020). Its developers acknowledge the difficulty of finding historical images for each building, making the 3D reconstruction an extremely challenging problem. Taking up the source-based methodology, the research by Tamborrino and Rinaudo (2015) is useful when considering a demolished streetscape and making use of various historical drawings to compile a reliable historical 3D world, and the Pudding Lane project's (Dempsey et al. 2014) creation of a textured seventeenth-century London streetscape in 3D provides an authentic virtual urban experience. Last, the research project focusing on Early Baltimore streets (Rubin 2020) innovatively attempts to interrelate groups of agents with the street space surrounding them; nevertheless, their work-in-progress remains at the phase of attributing human agency very implicitly in 3D.

As a consequence, the recent concepts highlighted involving the historical GIS approach when studying historical street life at large are critically important. Moving towards 3D space digitally, however, the research remains limited and is mostly bounded to the building envelope in efforts to represent the street space in 3D space. Digital reconstructions guided by the interpretive process possess tremendous potential as an analytical research tool, allowing scholars to test their hypotheses in a blended way and to answer historical questions about lived space, mobility, and the urban landscape.

3 The Digital Attempts to Reconstruct the Pre-Modern Urban Space of Edo

The long-lost urban space of pre-modern Edo has attracted substantial historical research, especially during the seventies and eighties. This scholarship has been grounded in various disciplines: architectural history, Japanese history, urban planning, archaeology. The insights of leading scholars such as Tetsuo Tamai, Jun Hatano, and Nobuyuki Yoshida, to name only a few, into issues concerning the commoners' district in Edo have addressed its diverse aspects, ranging from its physical built environment to its administrative system and social structure and to people's everyday life and their changes over time. These research efforts resonated with a strong aspiration to reconstruct the lost cityscape (Takahashi 2018, 10-19, 39-61). Many attempts have been made to reconstruct the visual appearance of the city and its streets, first via physical scale models, more recently via digital technology.

Museums in Tokyo began featuring multiple scale models as historic reconstructions, created by many architects and in varying scales, to showcase the city's urban development from the Tokugawa period up through modern Tokyo. Among the highlights are the scale model showcasing the northern half of the Nihonbashi commoners' district, exhibited at the Tokyo Metropolitan Edo-Tokyo Museum, and the model on the urban space around Edobashi Bridge together with its adjacent *hirokōji* (wide street), which was on view at the National Museum of Japanese History. Realised by Hatano, both scale models stimulated the intellectual curiosity of museum visitors with their 'realistic' visual representations of now-lost urban spaces. Although Hatano based these scale models on multiple layers of knowledge and had implemented a thoroughly interdisciplinary investigation based upon historical documents (Hatano 1987; 1998), it is inevitable that in most cases one fails to trace the information presented back to its provenance (instances of the black-box effect). Furthermore, the separation of the scholarship from the 3D visualisation becomes critical since such physical models cannot be changed or revised when new historical evidence comes to the fore.

The arrival of 3D techniques that can be used in digital visualisations also fostered many digital attempts to restore the lost appearance of Edo within two main sorts of initiatives. On the one hand, some scholars based their studies on seminal findings on the 'past' and used 3D reconstructions not as an aesthetic model but rather as an analytical tool to support the scholarly investigation process. One such work was created by Tachikawa, Takeuchi, and Yoshihara (2003) who published the digital drawings of the reconstructed streetscape in Edo's city centre. Based on archaeological findings from the foundations of a *dozō* (storehouse) excavated beneath the early modern

strata within the Nihonbashi commoners' district, Takaya and Yoko-ta (2003) digitally reconstructed the view of the site by comparatively integrating knowledge about *dozō* buildings' design specifications at nearby sites. In a more recent study, Hashimoto and Masuta (2018) examined the Great Meireki fire in 1657 and the fire prevention system in Edo together with the NHK Japan Broadcasting Corporation via a digital simulation of the fire and put forth hypotheses about vacant urban sites.

On the other hand, however, there are potential problems caused by the ability we possess today to create a 'real' image of the 'past'. Certain works, especially when solely designed for public engagement, are dominated by the polished visual appearance characteristic of the digital model. For instance, through virtual reconstructions the ongoing *Edo Persistent* project is currently taking ambitious steps through its integration of recent research progress with regard to the capital city's urban history in order to demonstrate the drastic change of the Ginza's streetscape in the Edo, Meiji, and Shōwa periods (Ito 2020). However, the immense historical knowledge employed for the design is generated via a generic evaluation of the historical spatial properties and space-use patterns, whereas the decision-making process that has been integrated is based to a greater extent on rule-generated volumes to the enhanced 3D models.

A significant concern, from the perspective of historical research, is the observation that the capacity of cutting-edge digital technologies to present a 'realistic' optical image can give an apparent impression that such images are absolutely true to the historical reality, as has been discussed by Peter Burke: the 'reality effect' of well-preserved historical architecture can give the visitor "a sense of direct contact with life in the past", even though such "immediacy is an illusion" (Burke 2019, 106-8). This may raise a particularly crucial problem with regard to the studies of lost cityscapes such as those in Edo, whose extant relics are extremely limited and the availability (or scarcity) of historical evidence and its granularity largely vary from one place to another.

4 The Case of Edo: Urban Form, Dwellers, and Street Life

Developed as the Shogun's residence and the seat of its political power, the castle town of Edo was characterised by a segmented socio-spatial structure whose parts were nonetheless interrelated. The city, accommodating a large population of diverse social standing, was marked by urban space segregated according to social status and spatially divided into separate areas: warriors', commoners', religious districts, and Eta and Hinin villages, respectively. Nevertheless, the different communities were not completely isolated. They

interacted with one another through, for instance, economic activity, the warriors' class serving as consumers and the commoners as suppliers (Iwabuchi 2018).

The streets that crisscrossed the city of Edo demarcated socio-spatial segmentation but nonetheless functioned as intermediary spaces that bridged the separated areas. Furthermore, inside the commoners' district, the streets performed as a bonding space that united the community. The oldest part of the district, built during the initial stage of urban construction at the north side of the Nihonbashi bridge (first built in 1603), divided the space by streets into urban blocks of 60 ken (about 109 meters) squares each. The two sections that faced each other along the opposite sides of a street constituted a *chō* (town/quarters/neighbourhood), which formed the basic unit of communal society and administrative governance (Tamai 1986a, 16-47, 106-22).

From the material aspects, a *chō* consisted of (i) residential sites; (ii) essential infrastructure, including streets, waterworks, wells, garbage dumps, and shared toilets; and (iii) communal facilities for the (self-) governance and maintenance of the neighbourhood's safety with regard to fire and crime prevention, such as town gates, guard-houses, fire watchtowers (Ito 2018). On the practical side of maintenance and preservation works, the street space shared by the community functioned as the 'axis' that "tied the social relationship and spatial unity of the *chō* as a community" (Takahashi 2018, 109, translation by Author Yasunaga). In other words, the street, unlike those in the modern city in which blocks are separated from others as boundaries, was considered the space that was subsumed by the neighbourhood (Takayama 2018, 203).

The fair versatility of street space, as demonstrated by its physical and functional plasticity, is conspicuous for instance in the shop-front space covered under eaves overhanging the street. The shop tenants along the street opened the space to use it as an extended shopfront. When it was closed at night, the space would be restored to the street, being regarded as part of it (Tamai 1986b). The demarcation between the open street space and the buildings was not predetermined or fixed but rather was adjustable and flexible. Such an interface of space between the street and its buildings, and the versatility of such spaces, are essential characteristics of the urban space of Edo.

The digital reconstruction in this paper demonstrates such transformative, versatile, ephemeral characteristics of the street space in Edo by incorporating the shift in the time of day and thus arriving at a better understanding of the relationship and interaction between human agency and the built environment. We focus on the intersection of two arteries in the commoners' district of Nihonbashi, located roughly 500 meters to the north of the Nihonbashi bridge fol-

lowing the famous fish market, at the crossroads of the prestigious 'high street' offering strong economic advantages for merchants, Nihonbashi Street within the north-south axis, and the street along the Kanda moat connecting the castle to the Kodenmachō prison and the execution ground, Honshirogane-chō Street within east-west axis. Known in pre-modern Edo as the neighbourhood of Honshirogane-chō 2 chōme, today the location corresponds to the Nihonbashi Muromachi 4 chōme, Chūō ku, Tokyo [fig. 1]. The area was chosen not only because it demonstrates the general idea of *chō* in the urban planning of Edo commoners' district, representing Edo's material qualities through the use of the particular wooden workmanship which substantially differentiates it from the European culture of bricks, stone and mortar, but also because it demonstrates the different spatial qualities and modes of interaction between people and physical settings on the street.

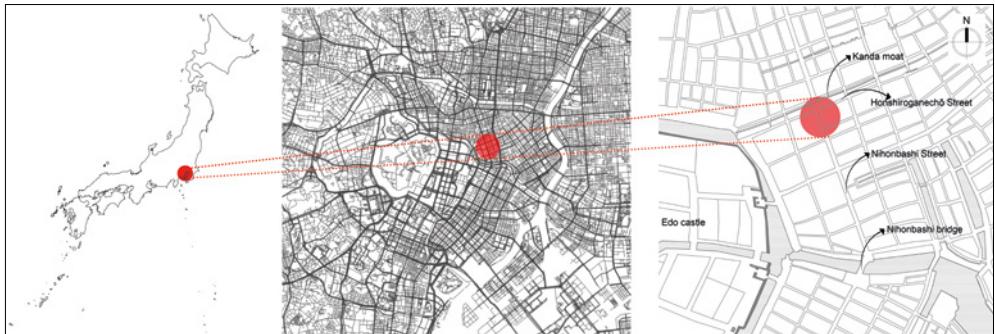


Figure 1 The case location on maps in (from left to right):
Japan, Edo/Tokyo, Nihonbashi commoners' district

5 A Digital Reconstruction of the Lost Streets of Edo at the Turn of the Nineteenth Century

Since the pre-modern stratigraphy of the case location has spatially vanished, leaving no physical trace *in situ*, there is neither the possibility of conducting any reality-based 3D documentation nor any sort of definitive publication about the archaeological excavations to draw upon. To research such a challenging case, we implemented a source-based approach by extensively investigating primary sources and the secondary literature and by comparing them.

Source-based digital reconstructions, being a synthesis of historical research or archaeological findings in 3D space, represent a key expressive medium of choice for complex information discovery (Demetrescu 2018). The London Charter (Denard 2012) highlights the great potential of such digital works, which can enhance our understanding of history by providing virtual access of spaces and phenomena that, being lost to the present, are otherwise inaccessible. Its robust and authoritative guidelines draw attention to the importance of ensuring the intellectual integrity of visualisation methods and outcomes through the use of relevant research sources and the explicit engagement in interdisciplinary projects. The report of the European Commission's Expert Group on Digital Cultural Heritage (2020) recently underlined the tight bond between the quality of 3D and key aspects such as historical accuracy, range of data and metadata as opposed to measurement through captured accuracy, photo-realism or resolution. Yet there is no standard 3D reconstruction method: the reconstruction process involves an extensive reasoning process and is highly interpretative, as would be required in creating validated visual content corresponding to a now-nonexistent object (Demetrescu 2018), and is a matter of the trustworthiness (reliability, certainty) of the conception.

In fact, the generation of a historical hypothesis as a digital reconstruction in 3D space is not a linear progression. Each virtual segment reconstructed in 3D derives not from a single source but is a result of multiple sources, corresponding to different spatial particularities, being blended together (Demetrescu 2018). An extensive 3D digital reconstruction such as the lost street space in Edo involves a dramatically different process than what one finds in reality-based reconstructions. Furthermore, the accuracy does not only entail geometric precision in the final output but also corresponds to the cognitive process, as every digital entity stems from an interpretive process blending multiple sources. Yet the process is not a simple decomposing of features: each feature is spatially tied to other features at different levels of spatial granularity. In turn, it requires drone-like navigation of the resources for deciding on each component that makes the street space an urban land-

scape in order to understand each feature's role in the structural making of the spaces.

Furthermore, it is very critical to assess how reality is captured in the available sources, since each piece of material is an interpretation of the past through someone's eyes. To avoid incorrect, inconsistent or missing information within the sources, we follow two major principles: (i) contextual assessment of the source itself and decipherment of how reality was represented in the segments of the source itself; and (ii) evaluation of the consistency within different sources containing the same historical and spatial information. The former requires an evaluation of the (visual) language, the creator's setting, the timeframe, and the context. The latter indicates a cross-comparison of multiple primary sources of one scene or multiple reproductions of the same depiction.

5.1 Primary Sources and Information Coverage

The records coming from the Mitsui Bunko Archives in Tokyo have been fundamental to this research [tab. 1]. For instance, Tamai (1977) argues that the cadastral register of 1807 must have been documented for the purpose of rebuilding after the Great Bunka Fire of 1806, which destroyed a large part of the Nihonbashi commoners' district. These documents carry the utmost historical value for unveiling spatial features and people's living conditions at this precise location. They provide a detailed view of the land use within the urban block located at the southern side of the intersection of Nihonbashi and Honshirogane-chō streets, as well plot dimensions within the land, the dimensions of the land and the plots, information on legal ownership, the land price, the rental amount of each plot, and the name and function of certain agents [fig. 2].

Table 1 An overview of the records from the Mitsui Bunko Archives

Date	Inventory as exemplified in fig. 2	Inventory number in the archives	Simplified inventory title
1808	(e)	No. 1733 (inv. no. 遣 696)	<i>Edo Kakaeyashiki Meisaisho</i> (Account book on Mitsui's land in Edo with inscriptions)
1807 with editions in 1836	(c)	No. 1734 (inv. no. 遣 697)	<i>Edo Kakaeyashiki Ezu</i> (Drawing of Mitsui's land in Edo with inscriptions)
Unknown [c. 1727-1729]*	(b)	No. 12234 (inv. no. 続 1546)	<i>Kakaeyashiki Ezu</i> (Drawings of Mitsui's land in Edo)
1754, 1802, and 1871, with editions in 1876	(a)	No. 12047 (inv. no. 本 2087-1)	<i>Edo Kakaeyashiki Onamae Kensū Koken Tsuki</i> (Mitsui's land in Edo, names, frontage width and land price)
Unknown [1726?]	(d)	No. 12236 (続 1547-2)	<i>Ieyashiki Tsubotsuki Shukuchintsuki</i> (Mitsui's land [in Edo], measurement and rent price)

* The date is based on the interpretation by Tamai 1977, 117.



Figure 2 Partial views of certain document pages available at the Mitsui Bunko Archives:
 (a) the land price, the year of acquisition and in pawn history, 1754; (b) the land use and vacancies, ca. 1727-29;
 (c) the ownership, measurement and disposition of each site inside the premise, as of 1807; (d) the rent price per *tsubo*, ca. 1726?; and (e) the ownership, total measurement, land price, and name of *yamori* as of 1808.

© The Mitsui Bunko Archives. Photo: H. Emoto

The second indispensable primary source for this study has been the *Kidai Shōran* (1805) (Excellent View of this Prosperous Age), a well-preserved, coloured picture painting scroll 1,232.2 cm long and 43.7 cm wide, discovered only two decades ago and kept at the Museum of East Asian Art in Berlin [fig. 3]. It illustrates the west-side view of Nihonbashi Street, starting at Imagawabashi Bridge by the Kanda moat, and ending with Nihonbashi Bridge; it covers about 760 meters of street length in a bird's-eye view perspective that spans five urban blocks and illustrating more than 1,600 people. It is acclaimed as a critical medium for visual memory in its portrayal of street life in Edo before the Great Bunka Fire, and since its discovery the accuracy of the entities in its visual depictions has been a great subject of criticism among scholars. Up to now, historians have investigated the scroll by focusing on different aspects of historical urban space and street life. They have looked at the texts-in-pictures to analyse each symbol and character depicted in the painting (Ehmcke 2007), have examined the degree of precision in the architectural typology of the *machiya* (townhouse) (Ito 2003), have identified the shop-names lined up along the street and have compared the indications on the scroll with other primary resources (Asano 2003; Kobayashi 2018). They have also specified the illustrated people's occupations and labours (Ozawa, Kobayashi 2020), have interpreted society's urban structure and the layered connections among people and within different groups (Yoshida 2003), and have investigated the illustrator, author and literati involved in the making of the scroll (Eriguchi 2017; 2018).

The works by Morisada Kitagawa (also known as Morisada Mankō, 1837), titled *Kinsei Fūzokushi*, which form an encyclopedic account of manners and customs in the Edo period, has also been an essential primary source for this research. His account is characterised by his comparative approach, which enabled him to differentiate the subjects in Osaka and Edo based on his own experience and observations, which were enhanced with excerpts and citations from literature and images. His descriptions, particularly those on architecture, were greatly detailed and were accompanied by illustrations with annotations for further clarification, making the books one of the most valuable overall sources for the study of daily life in the late Tokugawa period and a resource that has long proved reliable among scholars. His sketches, acclaimed for their high precision, include careful representations of some common architectural typologies of the era, such as *machiya*, *dozō*, and town gates and wells [fig. 4].



Figure 3 Kidai Shōran. Detail, showing Nihonbashi Street at the intersection of Honshirogane-chō Street.
Hand scroll, ink and colours on paper, 43.7 × 1232.2 cm. Japan, Edo/Tokugawa period, ca. 1805.
© Staatliche Museen zu Berlin, Museum für Asiatische Kunst, Former collection of Hans-Joachim
and Inge Küster, gift of Manfred Bohms. Photo: Jürgen Liepe

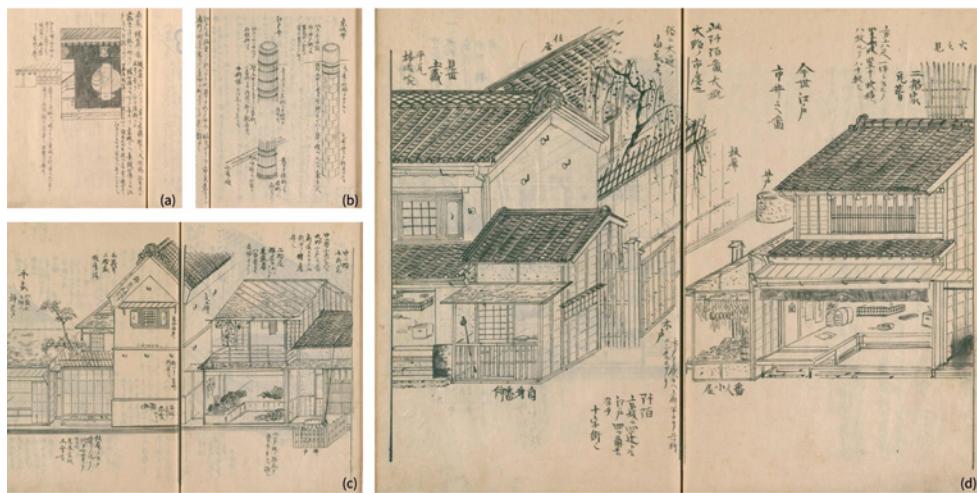


Figure 4 Example of street features in the work of Kitagawa 1837; (a) a detail from shop curtains;
(b) the structure of the wells; (c) a typical line-up along a street including *machiya* and *dozō*;
and (d) a street intersection, including town gates

Another primary source has been the regulations found in the *Edo Machibure Shūsei* (Collection of the Ordinances issued by the Edo City Magistrate's Office): for instance, those pertaining to the building construction restrictions, since street space belonged, in essence, to the public authorities (Kinsei shiryō kenkyūkai 1994). In addition, the magistrate of construction also supervised matters such as the construction of a new street (Matsumoto 2015; Takahashi 2018, 109-31).

The last primary source was the map *Edo Kiriezu* published by the publishing house Ōmiya Kingo-dō, completed as a set in 1856. These maps can be roughly translated as 'cut-in-pieces map of Edo', and a total of 37 maps cover the entire city (Takahashi, Murakami 1849). Although the representation of geographical accuracy was not prioritised in the eighteenth- and nineteenth-century maps of Japan, the *Edo Kiriezu* map represents the perception of urban space as it was lived in and moved through, demonstrating agents' intra-city mobility; it was published for the political purposes of urban planning as well as for practical use in everyday life. In particular, the section map of *Nihonbashi-kita* dating to 1854 has been insightful when assessing the streetscape within the urban context [tab. 2].

Table 2 Available primary sources about the case location and their information coverage

	Primary sources				
	Kidai Shōran scroll	The works by Kitagawa	Edo Machibure Shūsei	The Mitsui Bunko Archives	The map of Edo Kireuzu
Localisation (Exact/Proximate - in Edo)	E	P	P	E	E
Open street space morphology	dimensions				x
	material				
	alleyway	x		x	
	land-use	x			x
Building footprints	existence	x		x	
	dimensions			x	
Extended shopfronts	dimensions		x	x	
	shape	x	x		
	material		x	x	
	style	x	x		
	existence	x	x	x	x
Architectural features	dimensions				
	shape		x		
	material			x	
	style	x	x		
	existence	x	x		x
Human agency	spatial attribution				x
	outlook	x	x		
	density	x			
	space-use	x		x	
	mobility	x			

5.2 Spatializing the Historical Evidence in 3D

The buildings standing next to each other and occupying the juxtaposing plots facing Nihonbashi Street created the most dominant spatial unit at the streetscape in 3D space. The typical *machiya*, although there are some variations, followed a repetition pattern with a similar design format and created an abutted image along the main street. Closer historical investigation allowed us to obtain more detailed information about the space-use in the area, in particular the function of each shop and/or workshop occupying the ground floor of each *machiya*. At the intersection of Honshirogane-chō Street, we find the communal facilities of the town gate and guardhouse, and following that, going from North to South, we encounter a shop named Heizaemon Yamadaya's Raincoats, Zengoro Suharaya's *dozō*, the bookshop, and Hanbei Yorozuya's Buddhist figures shop. The lined-up *machiya* pattern altered with the purportedly unique one-story building with wooden shingles along Nihonbashi Street: Fujiya Mochi Restaurant, serving period specialities such as sweet bean porridge with *mochi* (rice cakes). Beside it ran an alleyway giving access to the rear-house tenements in the inner part of the urban block. Next to this alleyway, the last *machiya* within Mitsui's land had a carpenter workshop on the ground floor [fig. 5]. Further in the essay, we reflect on the spatial use by hypothesizing in 3D virtual space and blend the material culture with evidence on human agency.

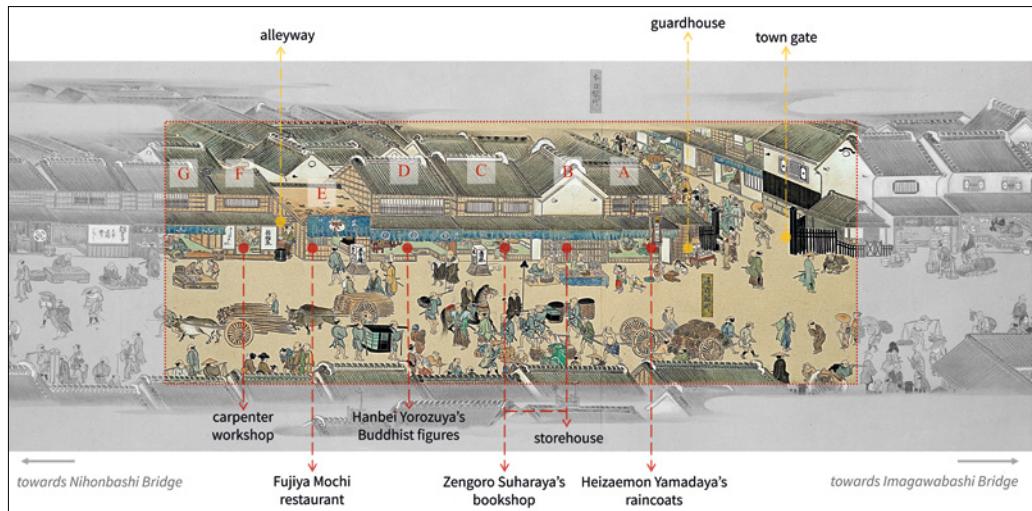


Figure 5 Kaidai Shōran. Detail, with annotations showing function of the shops/workshops on the ground floor. Hand scroll, ink and colours on paper, 43.7 × 1232.2 cm. Japan, Edo/Tokugawa period, ca. 1805.
© Staatliche Museen zu Berlin, Museum für Asiatische Kunst, Former collection of Hans-Joachim and Inge Küster, gift of Manfred Bohms. Photo: Jürgen Liepe. Annotations by Author Saygi

5.2.1 Digital Reconstruction Pipeline

The cadastral register showing plot divisions within Mitsui's land and annotated with dimensions has been fundamental for the spatial modelling performed here. We applied single image rectification to the photograph of this original document as a simple initial procedure to avoid camera distortions and the effect of the paper's curves. Although written measurements were indicated on the document, such rectification allowed an accurate comparison of the indicated distance to what had been drawn. Furthermore, it allowed us to hypothesise with reasonable precision the width of the alleyway after the alignment of the boundaries of the land at the north and south. The cadastral register demonstrated the alleyways within the land and its connection to the main street, and it marked the coverage of the shop eaves; however, it did not indicate any spatial properties concerning the surrounding two arteries (Nihonbashi and Honshirogane-chō Streets) and provided no further correspondence within the urban layout such as with gatehouses or urban infrastructure [tab. 3].

In order to extract more features at a greater scale, we worked with Edo Kiriezu maps. A priori, we georeferenced the section map of Nihonbashi-kita (1854) using an open-source GIS platform via the implementation of an automatic transformation method. Afterwards, we superimposed the interpreted drawing of the building footprints lined up at Nihonbashi Street on the georeferenced map section. Although the map provided no clues about the plot divisions and/or building footprints within the urban block, the urban blocks within the corresponding chō and the open street space layout were explicit. Alignment of these horizontal traces of the street network with building footprints showed only 4 degrees of angular difference along the north-south axis. We concluded that the drafting technique of the cadastral register in 1807 might not have reflected each building's façade rhythm nor the slight angular orientation of the land.

The superimposition also revealed a striking contradiction in the sense of scale if we compare the alleyway's width to the widths of Nihonbashi and Honshirogane-chō Streets, which follow the urban planning regulations in Edo. In the pre-modern era, the main street width, delineating regular urban blocks of 60 *ken*, were set to six *jō* (about 18.2 m), with smaller perpendicular streets measuring four *jō* (about 12.1 m), three *jō* (about 9.1 m), or two *jō* (about 6.1 m) (Sorensen 2002). Furthermore, the alleyways giving access to the interior of the blocks were designated only to be wide enough for one person to walk through and thus did not result in any greater width than 2 meters, which creating a dramatic contrast in width compared to the open street spaces surrounding urban blocks [fig. 6].

Table 3 The information coming from the cadastral register and their digital interpretation

		Records in the Mitsui Bunko Archives		Digital interpretation of the cadastral register			
		Measurement in Kyoma	Metric conversion	Drawn footprint in length	Roof eaves included (Y/N)	Corner of an open space (Y/N)	Shop eave (Y/N)
Total given length facing Nihonbashi Street		15 ken 2 shaku 5 sun	28.05 m				
From the corner of Honshirogane-chō street (North to South)	Building A	3 ken 1 shaku	576 cm	576 cm	N	Y	Y
	Building B	5 ken*	910 cm	490 cm	Y	N	Y
	Building C			434 cm	Y	N	Y
	Building D	2 ken	364 cm	364 cm	Y	N	Y
	Building E	3.5 ken 5 sun	667 cm	546 cm**	not applicable	Y	Y
---- alleyway ----							
	Building F	2 ken	364 cm	364 cm	N	Y	Y
Sum of the given lengths		28.81 m					
Difference between the indicated length and sum		76 cm (%2)					

* The land rented by Zengoro Suharaya, consisting of both the bookshop and the storehouse, were demonstrated together.
 ** It corresponds to the drawn footprint on the cadastral register and a dimension of 3 ken.

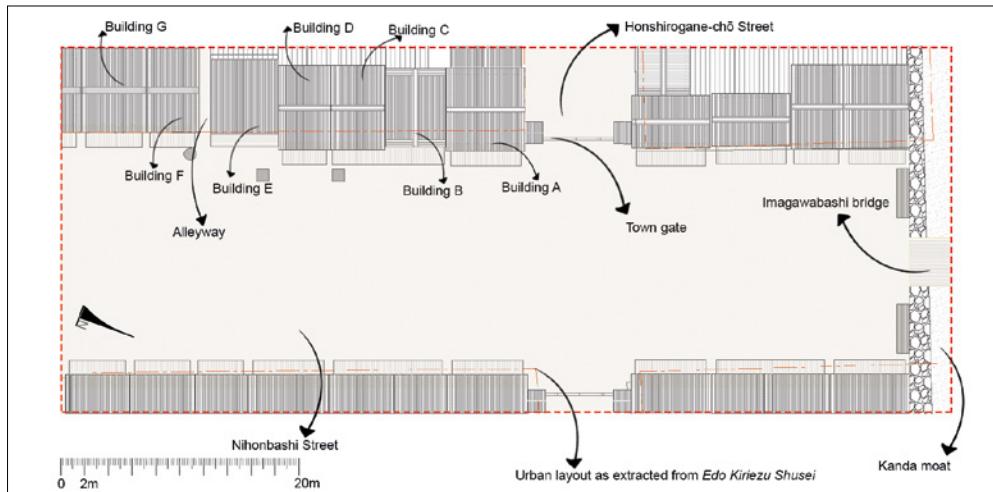


Figure 6 Site plan showing the case location

Another remarkable component contributing to the street space schematically shown by the cadastral register were the shop eaves facing Nihonbashi Street, something also demonstrated in the *Kidai Shōran*. The expansion of private space by means of the eaves was peculiar to Edo, as described by Kitagawa (1837), who compared the front eaves' structure in Edo with those in Kyoto and Osaka, which for their part were hung from the upper roof and were supported not by pillars but only by roof trusses. Moreover, the testimonies in *Edo Machibure Shūsei* include even greater detail about the exceptional regulations for two of the most significant main streets in Edo, each having the width of 1 *ken* (about 1.8 m), twice as wide as those along the side streets. Besides, another clause informs us that support of the wider eaves by pillars was permitted in those streets (Tamaï 1986b, 90-8).

In Nihonbashi, the buildings were typically two stories in height and were obligated to have tiled roofs for the sake of fire prevention. Ito's (2003) assessment of the architectural typologies of *machiya* along Nihonbashi Street as depicted in the *Kidai Shōran*, as represented by the artist and relating the proportions of the facades to the urban blocks' widths, concluded that the artist was precise in depicting the subtle differences in the building facades, whose average frontage was 6.43 m. To take this comparison to a fine-grain spatial layer, we first digitised his depictions as reproductions based on the scroll, and then aligned them to the length of the Mitsui's land, including within it each building's footprint. The comparison showed some proportional distortions at height and width, attributable to Ito's implementation being at a greater scale, taking the length of the urban blocks rather than basing them on the dimensions of an individual building's footprint (information rather scarcely available for pre-modern Edo). Still, having a strong proportional correlation and possessing a typological assessment, we reflected the typological clues such as window or roof types in our reconstruction [tab. 4]. Nonetheless, we did not rely on those reproductions as a unique point of departure. We employed a more accurate method, combining typological counters with plot dimensions per building, and cross-comparing those with information drawn from architectural rules and building standards in Edo [fig. 7].

Table 4 The architectural styles in/next to the Mitsui's land at Nihonbashi (adapted from Ito's 2003, 85)

Building number	Land of Mitsui (Y/N)	Building Type	Number of stories	Material style	Ridge/entrance	Tiled roof (Y/N)	Spatial organisation of ground floor	Opening type of first floor	Shop curtains
Building A	Y	<i>machiya</i>	2	wooden	Hirairi ⁱ	Y	open	Tateyoko goushi ⁱⁱⁱ	Half-length
Building B	Y	<i>dozō</i>	2	white plastered	Tsumairi ⁱⁱ	Y	closed		Half-length
Building C	Y	<i>machiya</i>	2	wooden	Hirairi	Y	open	Tateyoko goushi	Half-length
Building D	Y	<i>machiya</i>	2	wooden	Hirairi	Y	open	Fukiyose goushi ^{iv}	Half-length
Building E	Y		2	wooden		N	semi-open		
Building F	Y	<i>machiya</i>	1	wooden	Hirairi	Y	semi-open	Tateyoko goushi	
Building G	N	<i>machiya</i>	2	wooden	Hirairi	Y	semi-open	Fukiyose goushi	Half-length and long

ⁱ It signifies that the building has a gable roof and the entrance to the building was constructed parallel to the ridge.

ⁱⁱ The opposite of *hirari*.

ⁱⁱⁱ Latticework made of wood, composed of vertical and horizontal strips.

^{iv} Lattice strips with different widths are arranged in groups with equal intervals among the groups.

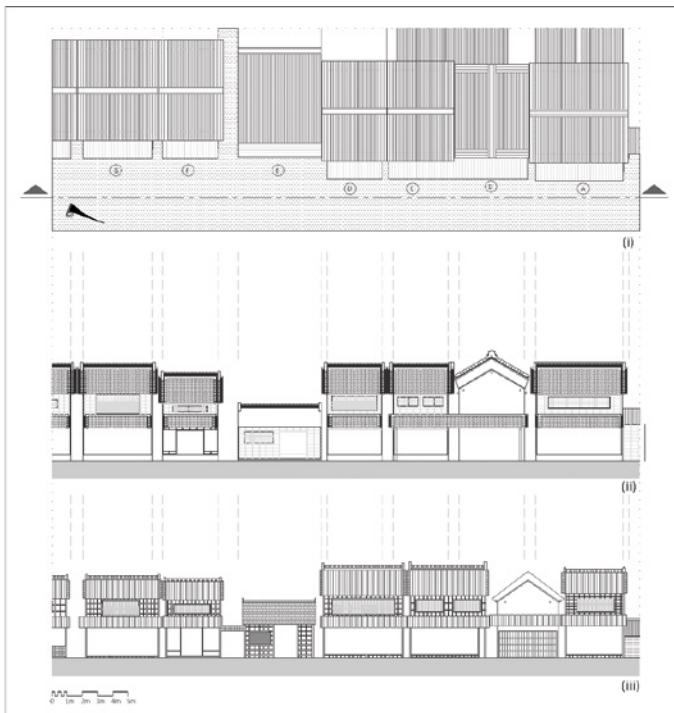


Figure 7 Comparison of the building footprints with street elevation: (i) site plan showing building footprints; (ii) proposed facade composition based on the digital interpretation; and (iii) digital reproduction of the facades by Ito 2003

Demonstrating the different modes of interaction between people and the physical/material settings on the street, it is remarkable to see how the ground floors' spatial organisation is designed to be mostly open and semi-open, contributing to the open street space during daytime in Edo. Prioritising the in-flux boundaries of the streets and elements of the transitional space, we digitally modelled each principal structure lined up along the street individually, using a bottom-up approach covering lateral-, top-, and base- envelopes.

The remarkable plasticity of Edo's built environment was based on three main constraints: the size of building frontage, proportions, and production standards. This, in turn, contributed to the creation of strong commonality in the urban space, especially along Nihonbashi Street. Because standardisation produced the unified look of the main streets and the secondary literature depicted structural components, dimensions and other characteristics, it was possible to complete the reconstruction in detail. For instance, the frontage length of a building was the major parameter defining architectural appearance, defining features ranging from the slope of the roof to the number of sliding screen doors. With size defined by the frontage, the second dominant structure are the roofs, which, in comparison to those of European architecture, are remarkably large because of the roof's symbolic status as a representation of the social status of its owner. Functionally, it created an extended space under the eaves that provided protection from environmental conditions such as rain or the high summer sun (Itoh 1972, 55-66). However, the repetitive pattern of the gabled roofs shaping the top envelopes were altered in Building F, which was single-storied and had a thatched roof.

In support of the dimensional aspects related to the architectural elements, we also made use of many works of secondary literature, applying information comparatively with that of the primary sources. Basing his work on the modular order of the traditional Japanese house and its features, Engel's work (1985) was highly useful with regard to the dimensions of the structural elements, partitioning elements, and the window details of the *machiya*. Hatano's works (1981; 1993) on other *machiya* and *dozō* within the Nihonbashi area were used as a basis for creating the scaled models in support of the reconstruction process when cross-comparing the proportion of the height/widths and extracting details of the elevated *tatami* floors and the roof. Fluidity and modularity were the most noteworthy aspects of reliance on wood as the primary material, together with the post-and-lintel system; standard dimensions of the materials, such as straw for the *tatami* mats and paper for the screens, increased the particularity.

Another vertical element contributing to the street space along the shop eaves were the *noren* (shop curtains). The curtain, typically a dark blue cloth, could assume various sizes and was hung at shop en-

trances, offering the functional benefit of protection from the sun and dust as well as providing shade and privacy. It was also used for advertising since it displayed a trademark or owner's crest. Structurally, it was hung from the top by knotted cords and suspended from a rod of bamboo. We could hypothesise about the communal facilities of town gates and guardhouses, along with the essential infrastructure of the wells located on the streets, by cross-comparing the work of Kitagawa with the Kidai Shōran. We did not, however, delve into infrastructure details such as the streets' water-drainage system.

The transformative feature of the street space can also be recognised through its changes aligned with the time of day. During the day, the street served to accommodate individuals' mobility and provided the space where businesses would take place. The street was an 'intermediary space' that acted as "the agency that connected one neighborhood to its external surroundings" (Takahashi 2018, 109). On the contrary, at night the town gates at both ends of the street physically separated one *chō* from the next, explicitly marking each as a closed, resident-only community space. After the gate was closed in the evening, a passerby needed to be attended by the gatekeeper stationed at the guardhouse in order to pass the neighbourhood the few exceptions to this intra-city mobility regulation being doctors and midwives (Ito 1987, 148-63).

5.2.2 Human Agency Within the 3D Space

We discovered that Takatoshi Mitsui acquired the first portion of land at the corner of Honshirogane-chō Street and Nihonbashi Street with a frontage width of roughly 28 m in 1687, a footprint expanded through the additional purchase of the juxtaposing area at the western side in 1691 (Edo Kakaeyashiki Onamae Kensū Koken Tsuki 1754). Nonetheless, Mitsui's family resided neither on that site nor in Edo like many other well-to-do landowners. The day-to-day practical management of the residential sites were entrusted to *yamori* 'landlord's agent/tenement superintendent', responsible for conveying the directives passed down from the *nanushi* 'neighbourhood chief' as well as collecting rent from the tenants (Sorensen 2002). From another record dating back to 1808, we learn that the neighbourhood of Honshirogane-chō 2 chōme, together with three other neighbourhoods, was under the supervision of a neighbourhood chief named Aketa Sōjiro, and the Mitsui's two sites were taken care of by three *yamori*, Denbei Takatsu, Sadakichi Yorozuya, and Yohei Yorozuya (Edo Kakaeyashiki Meisaisho 1808).

Even though a person had to own a residential site to be considered an official townsfolk dweller, such owners were rather small in number, and many did not live in their properties but rented them

out to tenants. It was these commoners in its widest sense who vitalised the streetscape: mostly tenants who earned their livelihood by working in a diverse range of occupations, from small to large business owners, artisans and craftsmen, market sellers and street vendors, to day labourers (Yoshida 1992).

In the Kidai Shōran, one discovers a vibrant mingled crowd that precisely reflected the mobility in Nihonbashi visible in the daytime. In the case location, we can spot people from various social classes, such as two commoners greeting each other, a woman going out of the back alley with her child, another woman listening to her fortune, a monk with his novice, a trader with his apprentice, a *sōji shiyo* (let's clean!) beggar sweeping the street, some street hawkers and samurai. Although it gives a lively picture of mobility as represented in various forms such as a samurai on horseback, a palanquin for samurai, and some ox carts transporting goods, it is quite cumbersome to fully decipher the everyday life patterns of agents, e.g. clerks, officials, and residents going to and from home and work.

In order to make a rough quantitative assumption regarding the number of people, *ninbetsuchō* (population registry) records for pre-modern Edo, might serve as valuable resources. Nevertheless, such records are scarce, as they were not spared destruction from frequent fires. Hayakawa (2014) states that there are only 26 *ninbetsuchō* records for only 12 *chō* in the city of Edo, dating from the end of the Edo era to the early Meiji period. In basing the estimate of the number of people we related our assessment only to the Kidai Shōran, as there is a certain threat to reliability when one includes human agency in certain numbers while thinking of the uneven distribution of the agents, whose patterns accord with different functions and restrictions in the street through the town gates. In addition, it would have been impossible to investigate each and every figure depicted on the street.

To illustrate people's appearances, we based our visualisations on real-life model photographs in the Edo Period collection of the Costume Museum in Kyoto, whose holdings include many items that show the changes in clothes and accessories throughout Japanese history (The Costume Museum n.d.). Since it is too early to conclude a matrix of possibilities that would cover the detailed apparel worn by the agents, we abstracted the figures into silhouettes, paying attention to the clothing and hairstyle outlines and distinguishing the appearance of commoners and other social classes. In addition, to give a proper sense of scale, we based the stature of the agents on research by Hiramoto (1972). The mean value is 155 cm for male and 145 cm for female silhouettes [fig. 8].

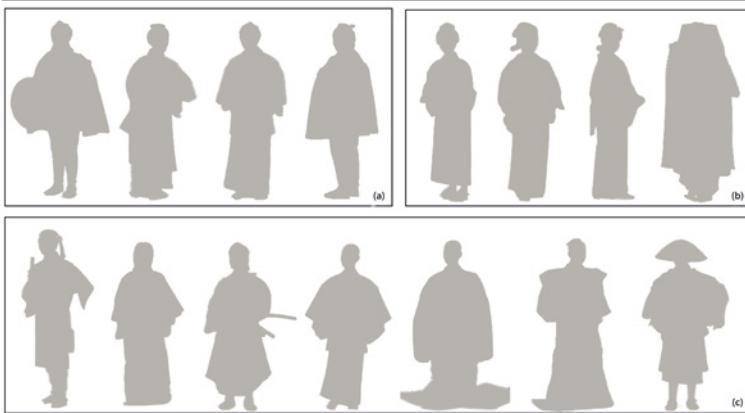


Figure 8 Examples of the silhouettes: (a) commoner/male; (b) commoner/female; (c) other agents from different social classes (warrior, Buddhist monk, samurai fighter), based on the collection of the Costume Museum, Kyoto

6 Results and discussion

The resulting 3D reconstruction digitally represents street life on Edo's Nihonbashi Street at the southwest corner of Honshirogane-chō Street during the Bunka Era at the beginning of the nineteenth century – specifically, in 1805 – as accurately as the historical evidence allows. The 3D digital reconstruction as a hypothesis does not only consider the built environment to be a static physical feature; rather, it attempts to present this particular instance of street life in a visual way that spatializes historical knowledge and presents a legitimate hypothesis. Furthermore, the reconstruction demonstrates the basic/general idea of *chō* in the urban planning of Edo commoners' district and is an example of a typical urban landscape [fig. 9].

Our particular attention directed towards the street's 'shifting boundaries', the digital reconstruction demonstrates the extension of the shops by the shop eaves and the expansion of the street via the spatial inclusion of 'indoor' space and acknowledges its importance in facilitating the livelihood offered on the main streets. At the same time, it emphasises the uniformity of the eaves, showing how every neighbourhood provided covered passage for passersby as informed by the Edo Machibure Shūsei. On the street, the division between public and communal ownership and private ownership was not always explicit but rather overlapped to accommodate certain flexibility, especially when the actual use of the space mattered [fig. 10].

Stylistically, the reconstruction shows the distinct qualities of surfaces as well as of shadow, light, and depth resulting from the atmospheric conditions and architectural culture. The modelling idea is far from the textured renderings. The reconstruction does not try to create a photorealistic result; doing so risks creating a perception of authenticity that would be false, given the lack of explicit sources. The realistic effect achieved via the rendering of materials and colours does not contribute to the trustworthiness of such an analytical 3D reconstruction in line with the available historical evidence. Speculative information is avoided.



Figure 9 3D street-views of the reconstruction at eye-level



Figure 10 The visual perception of the 3D space created by the extensions of the shops

During the day, the shops' sliding doors were held aside, so that 'indoors' and 'outdoors' as well as 'public' and 'private' were blended. But we hypothesise that when night fell, a different sort of street space emerged. The shops, by closing their sliding doors, created a 'wall', as Bharne (2014) suggests, and the regulation of the closing of the gates dramatically differentiated the boundaries of the night from those of daytime, which were more in flux. As a result, digital reconstructions of day and night illustrate the distinctive contrast in terms of street use and the urban experience between day and night. Daytime – where we find a 'high street' defined as a shopping destination characterised by a lively atmosphere of economic activity, with people from different social strata, from samurai to small street vendors, mingled together – is opposed to nighttime, with its closed gates and the limited mobility of people, evidence of a closed community [fig. 11].

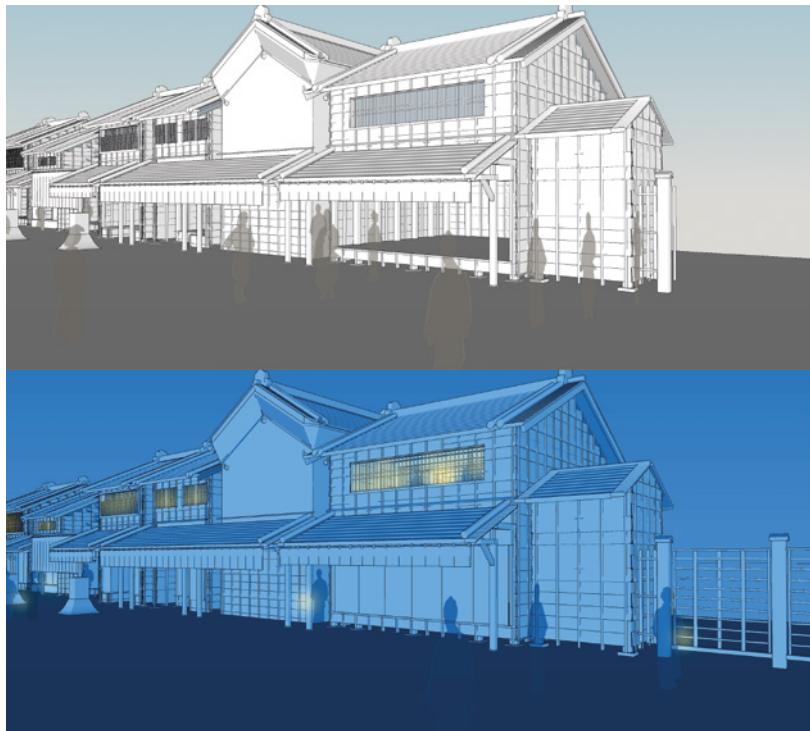


Figure 11 The daytime scene on top represents the street's boundaries, which are in flux; in the nighttime scene shown at the bottom, the buildings create a wall effect

Such a reconstruction creates a digital medium that is open to further revisions. Potentially other layers of historical knowledge about the culture or social life in this time and place could be represented. The level of complexity relies on a critical assessment of each digital entity's truthfulness. In such an extensive reconstruction, not all entities can be reconstructed based on the same degree of evidence. Neither it is possible to fully replicate the lost past as some sort of 'digital twin' or 'mirror world'. We defined the level of historical evidence for the digital reconstruction: one can see the areas reflecting higher levels of evidence in colour shades from pink to purple, whereas the areas relying on lower level of evidence are depicted in tones from yellow to pink [fig. 12].

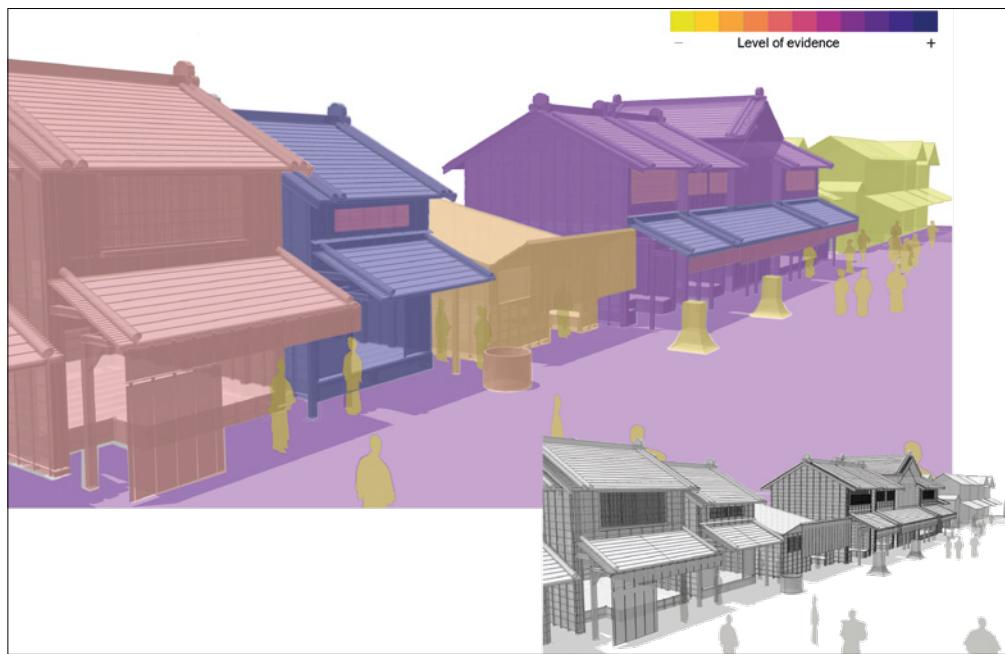


Figure 12 Scale of evidence in the 3D reconstruction

7 Conclusion and Future Work

This cross-disciplinary work has shown the interdisciplinary possibilities of exploring street life in the pre-modern city of Edo. The vibrant discoveries and insights have generated prompt advanced historical questions on materiality, spatial use, mobility of agents and the notion of community. Focused on a long-lost urban space, the work was always mindful of the importance of the assessment and interpretation process when overlaying evidence in a 3D space and has employed a source-based approach in its digital reconstruction of urban spaces. We hypothesised about street life within a digital environment as accurately as the sources would allow, and our hypotheses, using digital methods allied with primary sources and aligning with arguments in the secondary literature, avoided any speculative visualisation based on very limited evidence. Indeed, the interpretation process is where most of the time was spent, compared to the time devoted to the selection of the digital method, the modelling itself and the extraction of the outputs.

This research has digitally explored the streetscape as social space beyond its materiality and has expanded the *de facto* vision of the contours of buildings when working with virtual reconstructions, providing a vision accounting for the embodiment of the spaces depicted and the human agency evident there. We demonstrated the reliability of the model components through colour codes applied according to the scale of available evidence; nonetheless, it does not, by itself, present a rigorous transparency in the 3D visualisation. It generated an effective understanding of the ‘past’ but is not conclusive. A work towards that end would have to provide the ability to integrate source material for each component and enable a multifaceted process of discovery. Another step that awaits is the inclusion of deeper parts of the urban block, covering alleyways, back alleys, rear houses and comparing the street life between the front and the back areas in 3D space.

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No Sekai, 52-3.

From Distant to Public Reading

The (Hebrew) Novel in the Eyes of Many

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Abstract From its very beginning, the term “distant reading” (Moretti 2000) was controversial, displacing ‘close reading’ by relying on literary histories and thereby reflecting on the entire global literary system. One of the weaknesses of this approach lies in its exclusive reliance on canonical and authoritative historiographies, one or two for each national literature, something which is bound to over-simplify the complexities of national literatures. As is known, Moretti’s proposal became a ‘slogan’ for Digital Humanities while algorithmic manipulation of texts has taken the place of reading literary (human) histories. Yet the problem of over-simplification remains, albeit differently. As an alternative, we offer a fusion approach, radicalising Moretti’s idea. In this article, we demonstrate how computer-based analysis of different readings carried out by many readers – not necessarily professionals – produces a relatively minute picture. Our case study will be the Hebrew novel, from its emergence in 1853 to the present day; a manageable corpus on which we gather information using questionnaires we have carefully created in our lab. Alongside the presentation of our approach, the actual research, and its initial findings, we will reflect theoretically on the conceptual benefits, as well as the limits, of public distance reading.

Keywords Distant reading. Computational literary studies. The novel. Hebrew literature. Public reading.

Summary 1 Introduction: Size. – 2 Option #1: The Humanities and the Digitized Text. – 2.1 Option #2: Distant Reading and the Canonical. – 2.2 Option #3: Distant Reading and the Noncanonical. – 3 The Hebrew Novel in the Eyes of Many. – 3.1 Towards an Authoritative List of the Hebrew Novel. – 3.2 There are Questions to be Asked. – 3.3 Tell Me What You are Reading and I’ll Tell You Who You are. – 4 Initial Findings. – 5 Conclusions.



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1 Introduction: Size

“Some people have read more”, wrote Franco Moretti in one of the most quoted paragraphs in what later became a kind of manifesto of the Digital Humanities,

but the point is that there are thirty thousand nineteenth-century British novels out there, forty, fifty, sixty thousand – no one really knows, no one has read them, no one ever will. And then there are French novels, Chinese, Argentinian, American... Reading ‘more’ is always a good thing, but not the solution. (2000a, 55)

Clearly, at this early stage, Moretti had not thought of computers; he merely wanted to point out the limitations of close reading. And he chose to do so in a way that echoes Erich Auerbach’s remarks on the exact same issue, in the last article he published before his death nearly fifty years earlier ([1952] 1969). But in an age of growing data, it is no wonder that this paragraph caught the eyes of scholars who suggested various alternatives to good old human reading. From “Distant Reading” (Moretti 2000a) to “Macroanalysis” (Jockers 2013), from “Surface Reading” (Best, Marcus 2009) to “Algorithmic Criticism” (Ramsay 2011), from “Cultromics” (Michel et al. 2011) to “Cultural Analytics” (Manovich 2020), and beyond, the size – the size of what is known as “the great unread” (Cohen 1999, 23) – is presented as *a problem*. And while size, in and of itself, is not the only problem that the Digital Humanities are having to deal with, it is probably one of the most prominent ones. In effect, focusing on size widens the gap between Digital Humanities and the more traditional humanities. Because, for all the desire for reading that *does* move between closeness and distance – a position that many uphold (Hammond 2017) – in the end, as graphically described by Jean-Baptiste Michel et al.,

[i]f you tried to read only English-language entries from the year 2000 alone, at the reasonable pace of 200 words/min, without interruptions for food or sleep, it would take 80 years. The sequence of letters is 1000 times longer than the human genome: if you wrote it out in a straight line, it would reach to the Moon and back 10 times over. (2011, 176)

The scale chosen here to describe the size of the corpus is not accidental: it is difficult to think of a more challenging task, for a machine-less person, than that of occupying outer space.¹

¹ Michel et al. deal with books in general, not necessarily with *belles lettres*, but they call into question, and in a very figurative way, the notion of size. Moretti himself, deal-

But what if we *were* able to read the ‘great unread’? In our field, of modern Hebrew literature, Moretti’s description above, as well as the metaphorical journey to outer space, are simply not relevant. Although no one knows *exactly* how many Hebrew novels have been written – and we will return to this point later – we can calculate *roughly* how many have been published since the first one, *Ahavat Zion* (The Love of Zion), was published by Avraham Mapu in 1853.² And the number is not *that* big: the community of readers of modern Hebrew literature was quite small in the first decades of the genre’s existence. A new Hebrew language, allowing for essential daily communication that did not rely solely on the language of the sacred sources, had only just begun to emerge. Thus, from the mid-nineteenth to the mid-twentieth century, a few dozen novels, at most, were published, while the prestige of Hebrew literature was bestowed on two other of its forms: poetry and short stories. From the middle of the twentieth century onwards, the trend began to change. And although poetry and short stories continued to be written, the novel gained a significant place (both quantitatively and qualitatively), a process that reflected diverse cultural, national and political developments. From the establishment of the State of Israel (1948) until the time that these lines are being written, a few thousand novels have been published. So, all in all, the total number of Hebrew novels apparently does not exceed 8,500. While not an insignificant number, it is not an unwieldy one.

At this point in time, fortunately, it does not require getting to the moon and back. Many scholars, especially the oldest ones, have read a lot of the material. And from a computational perspective, as described by Marienberg-Milikowsky, it is a fairly convenient corpus: large enough for algorithmic reading, but not too large for human reflection (Marienberg-Milikowsky 2019). The question is, however, can we reverse the picture? Is it humanly feasible for us to re-read *the great read*, with mechanised reflection? How can we handle such a large-yet-manageable corpus? What are some of the methodological approaches we might use to reach beyond the canon? Alone, of course, we are not able to do that. But “some people have read more”... maybe *they* can help? Maybe ‘reading more’ *is* a solution?

In the subsequent sections of this contribution we turn to examine different methods and ideas that attempt to deal with a large corpus

ing with prose, described it in a way more familiar to the experience of a human reader: “a novel a day every day of the year would take a century or so” (2005, 4). Complexity, in addition to size, is another problem raised by textual data; and there is a close connection between these two, as shown by Schöch (2013).

² A few of the significant historiographies of Modern Hebrew Literature include the ones written by Gershon Shaked ([1977] 2000); Dan Miron (1979; 2010) and Yigal Schwartz (2005). Works on the Hebrew novel – as an independent genre – are not many, including *inter alia* Holtzman’s (1990) and Netanel’s (2016).

of texts. Following this, we will present *Roman Mafte'ach* (literally: *roman à clef*)³, a new digital approach we have developed aiming to deal with the Hebrew novel as a whole. We will describe the questions that such an approach can give rise to and look at both its possibilities and limitations. We will conclude this contribution with a section devoted to our initial findings, as well as with a few of our reflections and further suggestions. Setting our new methodology within the larger frame of Digital Humanities, we wish to offer it as another bridge between traditional literary studies and the digital age.

2 Option #1: The Humanities and the Digitized Text

Indeed, there are ways to deal with great *corpora*, and projects in the humanities are able to respond to the challenges posed by them. Such projects, varied in discipline, scope and technique, strive to include a large number of texts as their source material; they approach these texts as containing data, that is

a digital, selectively constructed, machine-actionable abstraction representing some aspects of a given object of humanistic inquiry. (Schöch 2013; emphasis in the original)

Thus, the machine, determining the dominance of quantitative methods, plays a crucial part in such projects. The text being digitised is (almost always) a condition, enabling this kind of research.

A prime example lies in a study that was carried out by Michel et al., presented in their oft-quoted article mentioned above, "Quantitative Analysis of Culture Using Millions of Digitized Books" (Michel et al. 2011). Aiming to observe cultural trends through quantitative investigation, the authors used 5,195,769 digitised books; according to them, this is about 4% of all books ever written (176). The term 'culturomics' was coined by them to describe this form of computational lexicography which, using Google Ngram Viewer, focuses on culture and on human behaviour. A similar methodological approach was used in many subsequent studies in many fields: history, media, linguistics and, more relevant to our study, literature. Thus, most projects in computational literary studies (CLS) – a relatively new branch of literary criticism and one of the main subfields of the Digi-

³ The title of the project is therefore based on the professional name of a specific genre, but it makes secondary use of it, taking it out of the original context: the project has no special interest in the *roman à clef* per se, but in the concept 'key' that it includes, which, in Hebrew also indicates an index. The key, or index, is an important part of the project's tasks, as we will demonstrate by and by.

tal Humanities – have heavily depended, especially since the turn of the twenty-first century, on big corpora of digitised texts analysed by means of computational processing. This is clear, for example, in the publications of the Stanford Literary Lab founded by Moretti and Jockers in 2009,⁴ and in the work of many other scholars and centres as can be seen in leading DH journals such as the *Journal of Cultural Analytics* (CA) that, in five years, has become one of the flagships in the field.

The computational manipulations are many and different. Among others, *topic modelling* algorithms, one of the most popular tools in the field, were designed to identify groups of words that are often associated with each other, in pre-chosen digitised documents, providing “a compromise between full manual tagging and naïve word counting” (Mimno 2012, 9). Good examples of this are Jockers’ and Mimno’s analysis of 3,346 works of fiction from nineteenth century English literature, focusing on the authors’ sex and on gender-related themes (Jockers, Mimno 2013), and Andrew Goldstone and Ted Underwood’s observation of trends in literary theory and criticism (Goldstone, Underwood 2014) – a study which is based on more than 21,000 scholarly papers in literary history, written over the course of 120 years. Such solutions must be accompanied by additional techniques, of varying levels of technological and conceptual complexity: from the use of graph theory (Moretti 2011), through other non-naïve word-counting applications such as TTR (type-token ratio), word clouds and more (Hammond 2016; Rockwell, Sinclair 2016), to manual annotation (Meister 2014) and alternative modes of data modelling (Flanders, Jannidis 2019) also adapted for literary analysis (Piper 2019) – the market of solutions is not small.

These options are available for any trained scholar who wishes to see cultural and stylistic trends in a large corpus of texts. The field is well established: this is almost a paved pathway. Though the prerequisite of the texts being digitised might be an obstacle, it is a technical (as well as legal) hindrance that is not insurmountable. And indeed, we have begun to enable such statistical measuring methodologies by archiving digitised versions of the Hebrew novel. Nevertheless, the platform we are proposing here is somewhat different. We will describe it in detail after surveying another, pre-computational, option.

⁴ See, for example: Heuser, Le-Khac 2012.

2.1 Option #2: Distant Reading and the Canonical

The methodological approaches described above, varied as they might be, are often placed under the umbrella of 'distant reading'. Thus, distant reading is usually seen today as any computational approach in literary studies (and related fields) that aims at a systematic consideration of a large corpus of texts without, necessarily, reading it at all. Therefore, distant reading (sometimes, and not necessarily) is identified with big data processing, with data visualisation, and more generally, with computer-dependent reading strategies that offer an alternative to traditional reading processes (Jänicke et al. 2015).

Nevertheless, a closer look at the first appearance of this concept, reminds us again that, back in 2000, computers were not included in its interpretive mission. Moretti published his groundbreaking article (Moretti 2000a) before entering the now-imperial kingdom of the Digital Humanities – or, to put it more simply, before he started using computers. A close reading of his distant reading approach might be conceptually useful here. Clearly, his corpus and its scope is different than ours: while Moretti was preoccupied with world literature, it is the (relatively small-scale) Hebrew novel that interests us. Yet the question remains the same: "The question is not *what* we should do – the question is *how*" writes Moretti, continuing by formulating that

world literature is not an object, it's a *problem*, and a problem that asks for a new critical method: and no one has ever found a method by just reading more texts. (Moretti 2000a, 55; emphasis in the original)

The new critical method suggested by Moretti is distant reading, offering a new way to approach the field of literary studies. A lot has been written about this approach in its early pre-computational version, its strengths and importance to the emergence of Digital Humanities, as well as its weaknesses: Moretti's model became a subject of much debate, seen as causing damage to what is sometimes perceived as the essence of the discipline (i.e. close reading of individual texts), as a model that is 'not-accurate-enough', and also as promoting western, English-language-oriented generalisations about third world literature (Arac 2012; Parla 2004). Later, as distant reading became more and more identified with computational analysis – a gradual and insinuative process, both in Moretti's own work (2005, 2013) and in the way the concept was adopted (or *not* adopted) in the research of many others – it naturally provoked further criticism (Ross 2014; Kirsch 2014; Underwood 2017; Da 2019).

Although (or, perhaps, because) it was revolutionary and audacious, over twenty years after it was first suggested, there are still

voices arguing that despite its significant achievements, the new paradigm has not resulted in a convincing combination of traditional research and technological perspectives. Some scholars admit that many typical projects of distant reading have not produced ‘great results’, failing to fulfil the potential of the model and disappointing also Moretti himself, who declared in an interview that “the results so far have been below expectations” (Dinsman 2016). As Adam Hammond explains:

[m]any distant reading projects have produced disappointing results because they have been more interested in validating their tools – showing that their computational methods are able to confirm existing stereotypes – than in pursuing genuine discoveries. Many others, meanwhile, produce provocative results that cannot be meaningfully validated. (Hammond 2017, 1)⁵

This critical voice has had an impact. At this point it may be too early to characterise current computational attempts at distant reading, but it seems that at least some of them have taken the criticisms into account. More and more works in Digital Humanities call for reflective observations, ones that have a greater degree of self-criticism and self-awareness; all the while, the issue of size continues to be one of the focal points of the discussion (Underwood 2019; Dobson 2019; Jannidis 2019).

On the other hand, Moretti’s early distant reading *does* deal directly with the problem it was created to solve, that is, with the problem of size. Not through machine learning, but rather – and this point should be emphasised – through second-hand readings of different literary *historians*. In other words, his main argument is made possible by an exclusive reliance on canonical and authoritative historiographies. He explicitly writes that his intuitions about the modern novel were supported by the following literary historians:

Gasperetti and Goscilo on late eighteenth-century Eastern Europe; Toschi and Martí-López on early nineteenth-century Southern Europe; Franco and Sommer on mid-century Latin America; Frieden on the Yiddish novels of the 1860s; Moosa, Said and Allen on the Arabic novels of the 1870s; Evin and Parla on the Turkish novels of the same years; Anderson on the Filipino *Noli Me Tangere*, of 1887; Zhao and Wang on turn-of-the-century Qing fiction; Obiechina, Irelle and Quayson on West African novels between the 1920s and the 1950s (plus of course Karatani, Miyoshi, Mukherjee, Even-Zohar

⁵ It is interesting to read this statement in light of the way Andrew Piper approaches the role of computational validation procedure in literary studies (2020).

and Schwarz). Four continents, two hundred years, over twenty independent critical studies, and they all agreed: when a culture starts moving towards the modern novel, it's *always* as a compromise between foreign form and local materials. (2000a, 59–60)

However, historiographies – reliable as they may be – take into account the canonical novel within their respective literatures (be it Yiddish, Arabic or Filipino).⁶ They neither challenge the canon explicitly, nor do they venture out to “the great unread” to use the terminology of Margaret Cohen. Thus, although Moretti undermines the dominance of European literature through his reading of, *inter alia*, West African, Latin American and Turkish historiographies, by doing so he still replicates the literary canon, within these respective literatures.⁷

Let us be reminded that studying the canon is, according to Moretti, close to “a theological exercise – very solemn treatment of very few texts taken very seriously” (2000a, 57). As demonstrated above, however, in the very same article Moretti in effect reflects on the canon of different literatures. “Conjectures on World Literature”, where the term ‘distant reading’ was coined, and where this idea was formulated, is where Moretti renounces both reading and the noncanonical in order to deal with size. As we will promptly see, in another article by Moretti, the noncanonical entered the picture differently, and using quite a different strategy. This time, reading – *real* reading – re-claimed its position.

2.2 Option #3: Distant Reading and the Noncanonical

In “The Slaughterhouse of Literature” Moretti is interested precisely in the question of the noncanonical; he proposes a change in our understanding of literary history, suggesting to look at both the canonical and the noncanonical (Moretti 2000b). With the help of students and research assistants he *reads* canonical and noncanonical detective stories, in order to discover the reason in their form for them being either read or unread. “Literary history is, and my the-

⁶ The very perception of the novel as a multi-faceted phenomenon underlies the comprehensive collection of articles edited by Moretti (2006); in a way, this is another reflection of his pre-digital distant reading approach. For a more unified perception on the development of the novel see Pavel (2015), who manifests another semi-distant-reading attitude. We believe that the two perspectives can add to each other, in the unique trajectory of the development of the Hebrew novel, including its complex relationship with the tradition of pre-modern Hebrew/Jewish literature.

⁷ For a broad look at the tension between local and global in the context of world literature and theory, see Damrosch 2003; Bar-Itzhak 2019.

sis here is that what makes readers ‘like’ this or that book is – form”, writes Moretti, focusing his attention on a (relatively speaking, of course) narrow *corpus*: about 20 detective stories in one experiment, 108 mystery stories in another. Big enough, but not too big (Moretti 2000b, 211).

Clearly, distant reading is the method here, too, albeit in a different way: now Moretti does not rely on historiographies of literary texts, but on readings of the texts themselves, using a concise research question (concerning the clue as a literary device in canonical and noncanonical detective stories) and employing different readers who, in his words, comb the texts for clues (Moretti 2000b, 212). In “The Slaughterhouse” the distance from the text had shortened; though not close, this is still reading. The noncanonical remains a (big) part of the question, yet the scope – indeed, befitting Moretti’s task in this study – is nevertheless much smaller.

As far as we know, Moretti has not returned to such an approach. Distant reading split into two different – perhaps even in some sense opposite – directions, and this observation is accurate, generally speaking, with regard to the work of the major players in the field. Indeed, there were a few rare yet serious attempts to combine the humanised and the computationalized, with a commitment to the theoretical and practical challenges involved (Meister 2014). However, for the most part, the humanised has been taken out of the computationalized. This has a price, first pointed out fifty years ago by those engaged in computational literary research in its early days, a long time before Digital Humanities became a buzzword: one does not perceive ‘the text’ merely as words, one perceives it as a set of relationships between him or her, and the literary work. Even in the age of computers, we cannot forget, thankfully, what reader-response criticism has taught us,

whether the computer has been used in ways that significantly alter our view of the literary universe, or whether it has merely been used to show, in more distinct outline and with more substantiating data, what we already knew to be there,

wrote Susan Wittig long ago,

The major conceptual problem [...] is the [computational] concept of the text [...] [while] the text acquires meaning, or rather is fulfilled with meaning, only in the act of reading, in the creative encounter between the reader and the text. The text exists, not formally, on the page, but phenomenally, in the moment when the reader invests it with meaning and value that are partly dependent on the author’s direction. (Wittig 1977, 211-13)

What was true for Wittig 44 years ago is true for us today as well, even if the tools that we use now are much more sophisticated. How can the two concepts of the text be combined into one? How can we retain the scope *including* the noncanonical part, without renouncing the reading? Finally, how can we use computers to support, rather than replace, reading? A few approaches address these questions. One, developed by Jan Christoph Meister and his team, deals directly with this challenge, and is represented pragmatically in the annotation platform CATMA (Gius et al. 2020; see also Horstmann 2020). Quite a different one harnesses the computer to support the research of *social reading*, a term referring to reading practices carried out digitally in social media, or in specific platforms. In fact, these two approaches, though very different, open the door for multiple, human reactions and considerations of literary texts (Vlieghe et al. 2016; Gius, Jacke 2017; Rebora, Pianzola 2018). With these ideas in mind, we turn to present our Hebrew novel project in detail.

3 The Hebrew Novel in the Eyes of Many

The Hebrew novel, being both big-enough and small-enough, can be seen as a case-study by means of which one can examine answers to these methodological and conceptual questions. Analysing it with algorithmic tools is a feasible task (even if we have to put a lot of effort into finding and developing NLP solutions for Hebrew, which, like other Semitic languages, is morphologically and syntactically different than European languages). Validating the results manually, even only partially, is a feasible task as well. But such a corpus may offer an even greater opportunity: limited as it may be, it is an *entire* literary field, rather than a fragment artificially created for research purposes. We have not determined how the corpus will be defined; we have started from the very reality of it as a fact, as a promising fact. And we want to read it before it becomes too big.

And yet, reading 8,500 novels is a challenge, particularly if we do not want to reflect on them through second-hand hegemonic and canonic historiographers and critics; particularly if we want to include *all of them*, and not only the canonical and studied ones; and also not just understand them as, say, 3,000,000 pages that need to be processed by digital and computational means, ignoring the fact that these pages are “fulfilled with meaning, only in the act of reading” (in the words of Witting 1977).

With these challenges in mind, we decided to turn to the public, and to experiment with a new type of reading, a new concept if you will: that of *public distant reading*. We realised that, if we turned to the public, to broad communities of readers (not necessarily scholars of Hebrew literature), we would be able to address all of these

issues. Through public reading, we will be able to cover, potentially, the entire corpus; we will be able to see beyond the canon, beyond the classics, and beyond the best-sellers; we will be able to get rid of hierarchies, both within the literary sphere of different sub-genres and other divisions, and also between our readers; and, as a cherry on the top, we will be able to gather hermeneutic-based knowledge that can deepen, and sometimes even contradict, any non-human computational attempt to analyse the material at a glance. In other words, turning to the public is a way of ensuring a broader scope as well as overall diversity, without paying the price of a non-reflective sampling of the texts in the corpus.⁸ Moreover, by bringing in non-professionals as reliable readers, the project is able to bridge the gap between academia and the public, igniting public interest in what is often considered ivory tower academic scholarship, and locating the novel (and its study) where it belongs: in society.

The method chosen is quite simple, and is based on the following steps:

1. composing a comprehensive questionnaire that will be addressed to the general readership, expert and non-expert readers alike, and that will ask for as much information as possible (objective and subjective) about the Hebrew novel;
2. distributing the questionnaire among readers' communities through electronic media, social networks and more;
3. collecting the questionnaires, sifting through the data and structuring it, then analysing it with statistical and visual tools;
4. validating fundamental objective elements that emerge from the questionnaires against more authoritative sources of information (see below);
5. at the same time, building a comprehensive digital corpus of the Hebrew novel, and analysing it with algorithmic tools based on the insights arising from an analysis of the questionnaires.

"Admittedly, contemporary distant reading is usually based on textual evidence, or on social evidence on dead people, rather than on questionnaires" writes Underwood in his "Genealogy of Distant Reading" (2017). And indeed, besides questionnaires-based studies in pedagogy (see, e.g., Miall, Kuiken 1995), we know of only one study that employed such a methodology: Janice Radway's *Reading the Romance* (1984), a feminist, groundbreaking work of reader-response, centring on a community of readers using interviews and questionnaires. Yet the focus of Radway was, first and foremost, the readers, and the ways in which they understood romance novels, as opposed

⁸ This approach, of course, is not unique to the study of Hebrew literature; it can be helpful in analysing any defined corpus of literary works, in any language.

to the way that critics understood them (Underwood 2017). Although we can use our data also to learn about communities of readers, this is not the only outcome of our project, which aims at using reader responses as a means for the study of the novel. In a way, we are applying the conceptual promise of computational literary studies into the realm of human reader-responses, in order to have a better understanding of our chosen literary corpus: the Hebrew novel.

In *Roman Mafte'ach*, then, we use questionnaires to collect data on every novel originally published in Hebrew, from *Ahavat Zion* (The Love of Zion) published in Vilna in 1853 till today, both in Israel and elsewhere.⁹ Thus, the project is haphazard in its essence, as we ask that readers answer a questionnaire on any Hebrew novel they have recently read: both canonical and noncanonical novels; both popular and belletristic; novels published by well-known and commercial publishing houses, as well as ones that were published by independent, small ones; Hebrew novels throughout the generations, across the continents in which they were published. We assume that once we see the Hebrew novel as a distinct phenomenon, and once we gain enough data on Hebrew novels, we will be able to draw connections between different types of data concerning different aspects of the novel. These connections have the potential to power ideas and arguments, and can only be perceived through public distant reading, when approaching the Hebrew novel from above.

3.1 Towards an Authoritative List of the Hebrew Novel

The anchor to this haphazard project is an inventory we compiled which includes all the titles and authors of the Hebrew novel, from *Ahavat Zion* to the present day. After a process of defining the large corpus, based on the catalogue of the National Library of Israel (which archives a copy of every book published in Hebrew, using the Library of Congress cataloguing system), we retrieved a list containing, supposedly, more than 13,000 novels. A thorough examination of this list revealed that many of the books that were included as novels are, in fact, essays, short story collections, textbooks, and more. We have automatically and manually sifted through the inventory, until arriving at a more-definitive list consisting of roughly 8,500 titles of Hebrew novels.¹⁰

⁹ Our approach can be compared to CATMA, which is similar in its theoretical essence, but practically different, as we do not collect text-linked annotations, but general metadata about each novel as a whole.

¹⁰ As an anecdote, scholars with whom we spoke about the project in its early stages found it difficult to provide an estimation of the total number of Hebrew novels. Some indicated extremely low numbers, no more than 2,000 novels. Those who indicated the

It is important to stress that the list includes data that does not exist elsewhere. This is because, up until our research, the Hebrew novel was not systematically catalogued as a distinct category in library catalogues and databases. The importance of this list is twofold: first, the inventory itself is a new source of data (mainly of bibliographical nature: titles, authors, year of publication, publishing house, number of pages). Thus, it answers several of the main questions posed when initiating the project, including the most crucial ones: how many titles make up the corpus of the Hebrew novel? And how are these titles distributed over time?¹¹ Second, the list is useful for validating, as well as anchoring, some of the data we collect using the questionnaires.

This way, the decisiveness of one source of information balances the open nature of the other, and vice versa. To start with, some easy, one-answer-questions – ones that the data from our inventory can easily deal with – can be productive. Indeed, Moretti's "Style, Inc." (2009) devoted solely to titles, demonstrates how a distant reading of thousands of titles can include cultural, as well as methodological insights. However, our project, consisting of data from the inventory as well as the questionnaires, aims to combine these kinds of objective (or one-answer) questions with more subjective or interpretive ones. Thus, it is one thing to determine the length of the novels in the corpus; it is quite another to explore the relationship between length and plot. It is one thing to check which wars are mentioned in the novels; it is quite another to ask if they are important in the narrative structure at all. It is one thing to explore the linguistic register of the novel; it is quite another to examine its connection to the type of narrator. We could list more examples here, but the idea is clear enough: given the scale of data we collect, the number of questions that can emanate from this project, as well as their complexity – relying on possible combinations of different aspects of the Hebrew novel – is limited only by our imagination.¹²

highest numbers spoke of no more than seven or eight thousand (a number relatively close to the one found in our inventory). These varied estimations point to the necessity of an authoritative and validated list, indicating the number of Hebrew novels; as is explicated earlier, such list became a central part of our project.

11 An interesting one-answer question – who is the most prolific author of Hebrew novels? – receives a decisive answer, based on our inventory: it is Bert Witford, pseudonym of multiple authors who wrote in the sixties, seventies and eighties some 170 (!) Hebrew novels (and more precisely, detective stories and pulp fiction). These Hebrew-original novels where presented by the publishing house (and catalogued sometimes by librarians) as translations – a strange episode in the history of Israeli literature and culture, which is not the place here to discuss; in other words, 2% of the Hebrew novel belong to pseudo-translated works, which, from the common academic point of view, are perceived as inferior to have a place in the standard historiography of Hebrew literature.

12 These, of course, are only a few examples. In the end, many disciplines and subdisciplines can benefit from the project: narratology, Hebrew literature, Jewish culture,

3.2 There are Questions to be Asked

Some simple and necessary details: the questionnaire of *Roman Mafte'ach* is designed to collect data in several main categories, using multiple-choice questions, linear scales, and a few short-answer questions which allow for more personal and interpretive responses. We have designed the questionnaire with the general public in mind, and therefore we have added clear explanations next to every literary or professional concept included in the questionnaire. Moreover, we have left the option to skip any question not understood.

Later on, we will reflect on the question of pluralism versus a systematic interpretation. But an intrinsic tension should be noted: a project based on questionnaires, although widening the interpretive horizons, still limits and structures (by definition!) the possibilities of interpretation. Such tension is inevitable; nevertheless, in our opinion it is not undesirable. Since our focus here is less on the reading experience and more on the novels as mediated by readers, we have decided to pay the price of forming the questionnaire in a way that supports our focus.

The questionnaire consists of many questions in the following categories:¹³

- **Biography and bibliography**

Name and sex of author, novel title, year of publication, position of the novel within the author's oeuvre, publishing house, editor, number of pages.

- **Reception**

The critical response the novel received, prizes (local and/or international) where applicable.

- **Structure**

Sub-genre, graphic components, sub-structure of the novel, chapter length.

- **Narratological aspects**

Type of narrator, narrator reliability, 'eventful' events, plotting, types of exposition and closure.

- **Language and reading experience**

Grammatical tense, linguistic register, other languages used in the novel, inter-textuality, and readability.

- **Time and space**

Temporal scope of the novel, main historical epoch, main space(s) in which events take place, main geographical area(s).

European history, as well as interdisciplinary studies that deal with the connections between *belles-lettres*, society and history.

13 We have decided to limit the number of questions, so filling out the questionnaire should take a maximum of 15 minutes.

- **Themes**

This part includes multiple-choice questions about many themes addressed by the Hebrew novel (e.g. love, family, childhood, marriage, physical illness, mental illness, crime, Judaism, Christianity, religiosity, war, sex, sexual identity, science and technology, climate change and more).

- **Personal assessment**

This part includes a reflective question about the effectiveness of the questionnaire, as well as an open question that allows space for other ideas and topics not directly addressed in the questionnaire.

3.3 Tell Me What You are Reading and I'll Tell You Who You are

Before we turn to examine some of our initial findings, a quick sociological insight, regarding the gap between academia and the public in the reception of our project, is called for. It should be said, without bitterness: so far, *only one senior scholar* responded to our call to participate in the research (one of 229 readers!) and only a few young scholars contributed by filling out a questionnaire. In private conversations, some of them expressed a real fear of recording insights from their research into the seemingly closed-ended templates of the questionnaire. Some even explicitly claimed that the project is 'too innovative' for them, or that they are no longer 'at the right age'. As a result, the bulk of our readers consists of the general public, people who define reading as their hobby, rather than professional readers, alongside a significant group of young literature students.

This situation is also evident from the place of the project in the media: radio broadcasts and podcasts, local newspapers, news websites and even the Israeli edition of *National Geographic*, all were interested in including an item - or more than one - on *Roman Mafte'ach*. The continual interest from the media, as well as numerous appeals from readers whom we seek to involve in the research, reflect, yet again, the public nature of our project.

4 Initial Findings

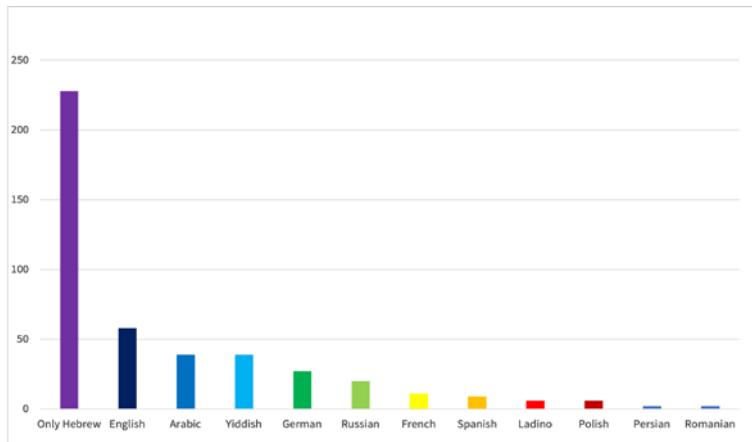
From readers to novels: the findings below are preliminary by definition. They represent the first experimental stage in the gathering of material, allowing us to test the method: its effectiveness as well as its challenges. Given the length of the questionnaire and the complexity of the task our respondents agreed to take on themselves, we estimated and hoped that by now we would have data on no more than three hundred novels. We knew that some readers might be deterred by its length and complexity, but we have decided to maintain

this relatively high bar as a threshold; after all, the questionnaires should be answered seriously and attentively. The answers, we assumed, would be enough to indicate initial trends and to reveal meaningful developments. And happily, within fourteen months, 525 questionnaires were collected, filled out by 229 readers, who covered in total 386 novels. What we have here is data on roughly 4.5% of the Hebrew novels ever published - assuming the total number of novels is 8,500, as indicated by our inventory. Good enough for a start. Consistently and persistently, we cover more and more sections of the Hebrew novel. We do not end here, of course: we are continuing to disseminate the questionnaires to as many readers as possible, including professional ones for more-specific reading tasks (as we explain below).

Preliminary as they were, the findings were astonishing: many scholars must have read more than 300 novels in their professional lives, guided by specific research questions or any other personal interest, but no one has seen them the way we, now, can see them. No one, as far as we know, could outline an empirical picture obtained from accumulating synchronously so much data that is both comprehensive and random - in the positive sense of the word.

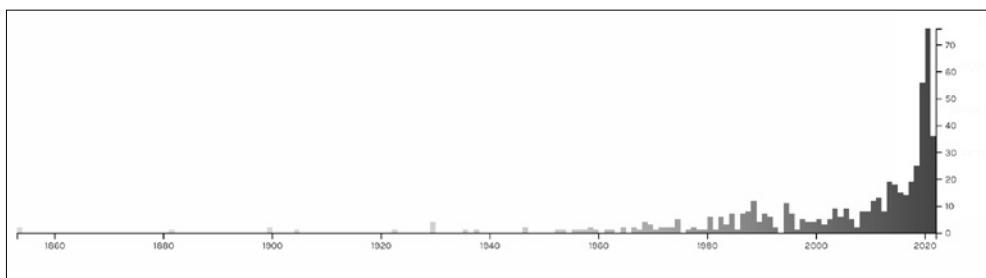
For example, none of them could say with as much clarity as we can now, that the variety of languages represented in the Hebrew novel encompasses within it intense cultural and historical tensions. It should be noted, for instance, that the most prominent language after Hebrew is English (and not Arabic, as one might have presumed); that Yiddish is ahead - quantitatively - of German; and that both of these are far ahead, quantitatively, of a distinctly Jewish language like Ladino [graph. 1]. At least in the case of languages in the Hebrew novel, even if a later picture is different, we can cautiously estimate that the difference will not be dramatic.

Graphic 1 Languages in the Hebrew Novel



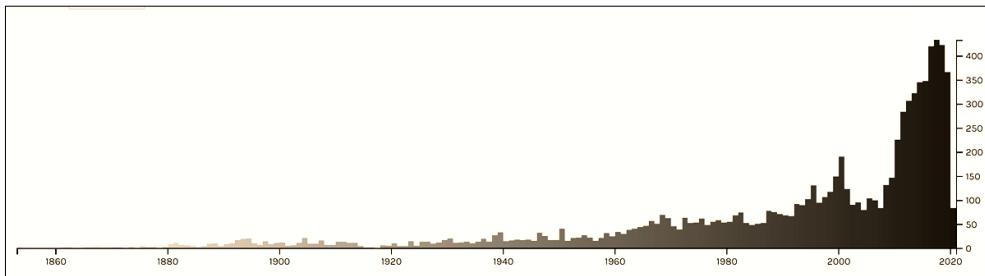
This figure, in itself, does not indicate any processes of development. The picture is static, unreflective of the history of, say, the emergence of English in the Hebrew novel, or the influence of other cultures (German, Russian, American, etc.), each in turn, on the Hebrew republic of letters. As the study progresses, we aim to show such developments. Moreover, since we asked the general public to fill out a questionnaire based on a novel that they have recently read, it is contemporary literature that is absolutely dominant in our database. As the following illustration shows, among the 525 questionnaires that have been collected so far as part of the project, a powerful bias towards the literature of the last twenty years is evident [graph. 2a].

Graphic 2a Timeline: Year of Publication of the Novels read in *Roman Mafte'ach*, updated to August 2021



The timeline that emerges from the questionnaires should be examined against the timeline that emerges from the full authoritative list of 8,500 novels [graph. 2b]; then, what seemed biased is actually seen as more accurate, as the two graphics reflect the uneven distribution of novels over time, with a notable peak in the last decade.

Graphic 2b Timeline: The Distribution of the Hebrew Novel over the Years

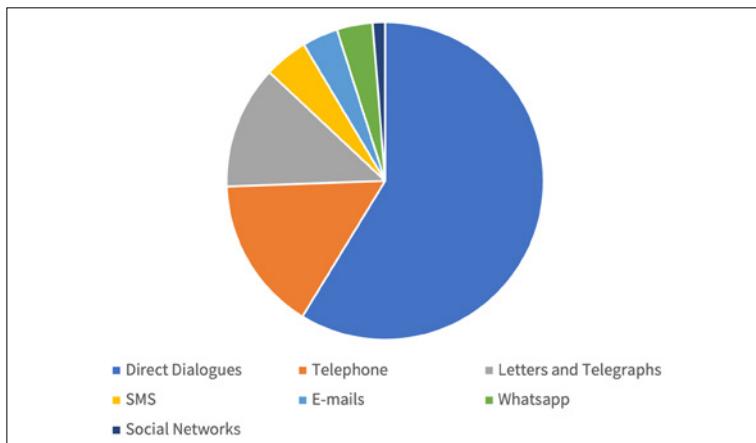


On the other hand, this bias, which must, of course, be taken into account when analysing the results, has also accentuated what is a very real and practical challenge: the general public does not guarantee direct and equal access to all kinds of knowledge. Clearly, contemporary readers tend to read recently published novels more than old ones. A lot can be learned from this about the reading habits of our readers (are there any other parameters – not only the time of publication – that influence the scope of reading today?). However, since our primary interest is in the Hebrew novel as a whole, we are encouraging professional readers (students, colleagues, research assistants) to fill in the gaps in our developed timeline.

Focusing on the range of years that is most represented in our data, some intriguing phenomena begin to emerge, things to examine in more depth in later stages of the project: when do Hebrew writers (avant-garde, probably) begin to use non-textual elements as part of the plot itself, not as an ‘external’ decoration to it, and not as part of the graphic novel? The answer, according to preliminary findings is, not before the last decade of the twentieth century. How does the typical graphic structure of a page in a novel change over time? According to the same preliminary data, it seems like in the mid-eighties some diversity began to form, with the ‘classic’ page (divided into paragraphs) taken over by two inverted page-models, one compact and dense, and the other spacious and airy. According to our readers, these are also the years in which the dominance of the omniscient extradiegetic narrator shifted, making way for the diegetic narrator, who is involved in the plot to some degree.

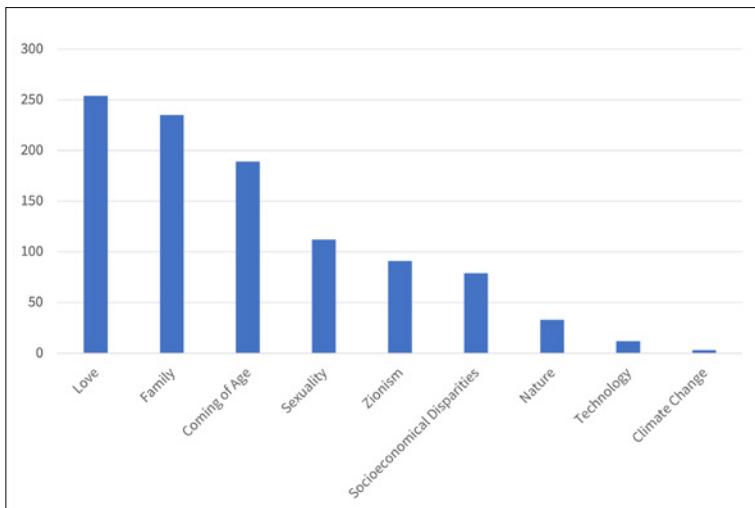
These findings still require future comparisons with earlier periods of the Hebrew novel. But some findings became even more significant than expected, precisely due to the proliferation of contemporary literature in our database. Among other things, in our questionnaire we examine the extent to which contemporary forms of human communication (emails, SMS, social networks etc.) are reflected in the novel – and the result was quite low: strangely, even books of the twenty-first century find it very difficult to translate our ultra-technological daily life into a mimetic representation [graph. 3].

Graphic 3 Communication in the Hebrew Novel



Moreover, as shown in the next figure, technology as a subject is almost non-existent in the data collected [graph. 4]. Not to mention the climate crisis, which, though a recurrent topic in the news at the beginning of our current millennium, is not reflected as such in the data. True, Hebrew writers are writing and publishing in the present; and yet according to our relatively rich data, it seems that they either do not see 'the now' or they do not give it an artistic mantle. The latter phenomenon was documented in contemporary novels in general, as brilliantly shown by Amitav Ghosh (2016).

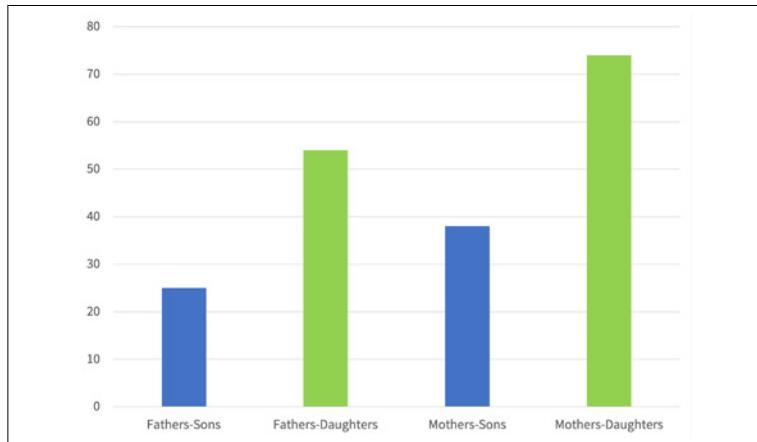
Graphic 4 Themes in the Hebrew Novel (Selected Categories)



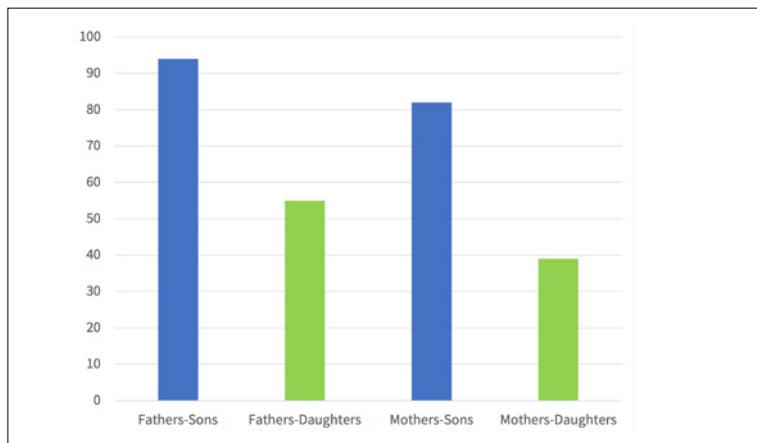
Some of our data show, also, a clear picture of the correlation between the intergenerational relationship within the family, and the sex of the novel's author. As shown in the graphics, women authors write more about daughters (and their relationships with fathers and mothers) while men write more about sons (and their relationships with fathers and mothers) [graphs 5-6]. It might not be surprising; we can assume that, in general, different people tend to write on what is like them. However, grounding this notion in facts, and being able to make correlations between this and other issues (for example: themes that women or men write on, the average page number for each, and more) can help to gain significant insights, and to make larger arguments about human culture in general.

Given, for instance, the fact that more novels are written by male than by female authors (as shown in our database), the overall result of the intergenerational relationships question is that in every parameter the male is the focus of literary attention during the history of Hebrew novel: consistently, more fathers-sons relationships are represented than fathers-daughters relationships; more mothers-sons relationships are represented than mothers-daughters relationships. And surprisingly, the exact same result is obtained in third-generation relationships as well: more grandparent-grandchild relationships are represented than grandparent-granddaughters, and more grandmothers-grandchildren relationships than grandmothers-granddaughters.

Graphic 5 Intergenerational Relationships: Female Authors



Graphic 6 Intergenerational Relationships: Male Authors



Our task is a big one for traditional methods, a humble one for computational ones. Since it is big, the current picture is partial and modest. But since this picture is also a humble one, it has become fruitful in spite of the difficulties.

One difficulty lies in the very basic notion of trust. We often get asked: "do you trust your readers? How come?". Going over each questionnaire, on some rare occasions we do find mistakes: one who

filled out a questionnaire about a translated novel (whose original language is not Hebrew), or another who included a children's novel (a sub-genre we have decided to leave out of the project). But such innocent mistakes are easily fixed by erasing the redundant data. So yes, in general we trust our readers, and the quality of data that we collect once and again vouches for them. In addition, the inventory mentioned above provides a source of validation, anchoring at least a part of the questions in our questionnaire.

The following is more challenging: we will happily receive multiple questionnaires on any one novel. Interestingly, and predictably, such questionnaires are almost never identical - at least in the more complicated and interpretation-dependent questions. Although this is quite confusing, we are not treating it as a threat to the methodology. True, we are extra-cautious when attempting to include this information in standardised graphs. But apart from this, we celebrate the difference, the multiplicity, going over the different readings and appreciating the smaller, as well as the larger differences, as they imply different readings, different points of view, different opinions. Indeed, as traditional, close and human reading is: you can never read the same novel the same way twice, you can never read it the way your friend does, the way your colleague does. Moreover, we see it as an opportunity to examine our questionnaire, as well as some of the concepts in narratology and in the study of Hebrew literature.

The final section of Moretti's paradigmatic article includes a manifesto calling for intellectual attempts to reach the great unread by developing new, audacious methodologies. We quote this final paragraph here, as we see our project as an answer - even if only partial, as answers tend to be - to Moretti's call.

Fantastic opportunity, this uncharted expanse of literature; with room for the most varied approaches, and for a truly *collective* effort, like literary history has never seen. Great chance, great challenge (what will knowledge indeed mean, if our archive becomes ten times larger, or a hundred), which calls for a maximum of methodological boldness: since no one knows what knowledge will mean in literary studies ten years from now, our best chance lies in the radical diversity of intellectual positions, and in their completely candid, outspoken competition. Anarchy. Not diplomacy, not compromises, not winks at every powerful academic lobby, not taboos. Anarchy. Or as Arnold Schoenberg once wonderfully put it: the middle road is the only one that does not lead to Rome (Moretti 2000, 227; emphasis in the original).

Radical diversity; anarchy; collective effort; diversity of intellectual positions; varied approaches. All of these - diversity, anarchy, varied

approaches – are here, all are interesting. True, all of these do not make the study any easier, but once this *messy* data – again, in the positive sense of the word – is before our eyes, it is hard to ignore it.¹⁴

5 Conclusions

At first it might seem as if what has been proposed here is nothing but a technical solution to a conceptual problem: the problem of size. But we are hopeful that, on second glance, things will take on a different aspect, and it will become possible to realise the potential of our approach. In a way akin to algorithmic practices, dealing with literature indirectly, reading (or, unreading) it through the lenses of others, has the potential to miss direct contact with the text itself. But unlike in the case of those practices, whoever chooses the approach proposed here will not give up on human (unmediated) contact with the text. In other words, *distant public reading* actually returns the reader's interpretive sensitivity to the picture. Here, we do not extract literary, thematic, or structural insights from word clouds, or from vector representations of words in an abstract space; rather, we listen to what many readers have to say – through our structured yet broad questionnaire – even if that information is ‘dirty’, contradictory and confusing. We do not take the human out of the humanities: those who read the novels are human beings (not machine-learning algorithms); those who make the combinations and ask the questions are human beings, too; those who interpret the data, who perform the distant reading that this project enables, are human beings who wish to see the field from a distance. These human beings harness the technological processing and analytics for this task. A balanced quantitative, computational approach helps us to ground our intuition in data – graphs, numbers, percentages – without leaving the readers and scholars outside of the interpretive picture. Therefore, we cannot – we must not – expect human insights to be clean. Along with the many novels, there will be many readers, and therefore also many questions and answers.

This is also the case with the scope of the multiple possibilities which our approach opens: it does not contradict, prevent or limit other attempts in the humanities. In fact, it may aid them: first, as a tool for detecting and sorting phenomena in literature, and second, on a broader level, it can serve as a reference to be compared with

14 In recent years, Digital Humanities seem to be more and more aware of the questions of the discipline in its global context, as reflected, for example, in the forthcoming publication of a special volume dedicated to the issue, as part of the influential series *Debates in the Digital Humanities* (Fiornonte, Ricaurte, Chahudhuri, forthcoming). We see our project as a modest contribution to this important development.

other approaches. Thus, it encourages ‘traditional’ scholars to continue to define a smaller corpus, based on the questionnaires; at the same time it encourages DH researchers to continue on their own way – without reading – but through a thorough comparison of their computational findings with what emerges from the questionnaires. *Roman Mafte’ach* suggests an on-going, additive, and changing discussion, one which is intellectual (and public), humanist (and proven), thought provoking (and grounded in facts).

We want to read as many novels as possible, but we have not reached world literature; we remain within the bounds of our language literature, which is seen also as national literature. However, within the boundaries of this national literature, we have chosen the broadest common denominator – that of language which has no actual boundaries.¹⁵ Since Hebrew literature has always been written in different centres around the world making contact with different cultures, one might say that the borders in question are, in a sense, loose: they are not limited to the actual territorial boundaries of the nation-state (which, in many cases, are artificial with respect to culture); and nor are they restricted to the national, ethnic or religious origin of the author. “Our philological home is the earth; it can no longer be the nation”, wrote Auerbach ([1952] 1969, 17) beautifully, acknowledging that the task of world literature, in a world of nation-states, physical borders and national literatures, is not an easy one.

¹⁵ It will be fascinating to see our findings on the backdrop of other language-literatures; to be able to compare and contrast, in order to get to broad cultural observations and insights. From the point of view of world literature, it would be a promising endeavour. Despite that, such attempts to compare are rare and challenging. See, for example, Wilken 2021.

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Digital Archaeology: From Interdisciplinarity to the ‘Fusion’ of Core Competences Towards the Consolidation of New Research Areas

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Abstract The aim of this article is to explore the interdisciplinary turn observed in the development of humanities computing, in terms of integration and fusion of expertise. The debate started with the Seminar on *Discipline umanistiche e informatica. Il problema dell'integrazione*, held in 1991 at the Accademia Nazionale dei Lincei. Moving backwards in time, already from the 1960s the role of ‘integration’ was at the heart of many interdisciplinary initiatives supported by the National Research Council of Italy and the Accademia Nazionale dei Lincei as part of their coordinated efforts to promote scientific progress. Through a number of archaeological case studies pivoting around the Etruscan civilisation, it will be shown how over time archaeological computing, and its evolution towards digital archaeology, has found in GIS and multimedia systems a unitary platform on which methods and practice of data acquisition, analysis, interpretation, and communication can converge. The concept of ‘fusion’, however, is much more recent and responds to a global resource management model, which combines the methods of archaeology with the objectives of Heritage Science, along the research path that goes from field and laboratory investigation to the protection, enhancement and communication of cultural heritage.

Keywords Archaeology. Archaeological computing. Digital archaeology. Digital cultural heritage. Heritage science.

Summary 1 Introduction. – 2 From ‘Symmetry’ to Interdisciplinarity. – 3 Archaeology ‘Ancillary’ Sciences. – 4 Multiple and Complementary Aspects of an Interdisciplinary Research Approach. – 5 Computational Models in Archaeology: A Forty-Years Research Path. – 6 Digital Archaeology and Heritage Science. – 7 Conclusion.



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1 Introduction

In 1991 Tito Orlandi organised the seminar *Discipline umanistiche e informatica. Il problema dell'integrazione* at the Accademia Nazionale dei Lincei (Orlandi 1993), where the scene was set for a debate on how the humanities community could embrace computing and technological innovation, balancing scholarly tradition against conceptual and methodological renewal. Promoted by the Centro Linceo Interdisciplinare “Beniamino Segre”, the seminar set out to address the specific theme of ‘integration’ with the aim of finding some common ground between information science and humanities scholarship, in order to outline a cross-disciplinary approach.

Before examining the evolution of this process over time – drawing particular attention to archaeology and cultural heritage studies – it will be worth briefly tracing back the history of the ‘interdisciplinary’ turn of events in Italy, by following the initiatives supported by the National Research Council (CNR) and the Accademia Nazionale dei Lincei as part of their coordinated efforts to promote scientific progress.

2 From ‘Symmetry’ to Interdisciplinarity

In 1969, Beniamino Segre, the renowned mathematician, chaired the Steering Committee of a symposium on ‘symmetries’ held at the Academy (*Simmetrie* 1970). The conference gave the opportunity to discuss how symmetries could act as a propelling and unifying force: as Segre said, much of the progress that had taken place in several research areas hinged on symmetry-related phenomena, which led to uniform patterns and procedures and, at the same time, interconnections. Such thrust effectively was opposing the disruptive trend stemming from the necessary, but controversially harmful, specialisation of knowledge (Segre 1970).

At the end of the symposium, after Ugo Spirito’s concluding lecture on the concept of symmetry from a philosophical perspective, Giovanni Battista Bonino was invited to present a draft proposal, which the Assembly approved by acclamation. In fact, drawing on the success of the symposium as an interdisciplinary event addressing a wide spectrum of scientific domains, the project of establishing a centre for mathematical and physical studies at the Academy was brought forward with the idea of fostering collaborative development between scientists from different research backgrounds.

As Tito Orlandi has recently pointed out,¹ the Centro Linceo Interdisciplinare di Scienze Matematiche e loro Applicazioni was established two years later, chaired by Beniamino Segre, with the mandate of promoting innovative projects to encourage interaction between individual disciplines with particular reference to mathematical thought and its applications. Among these projects, the humanities were soon brought to the forefront of research priorities, also in terms of the training needed for young scholars through the awarding of fellowships.

The series *Contributi* promoted by the Centre, which started with the publication of series of lectures and seminars, soon witnessed a growing interest in transversal issues on the part of humanities scientists in a wide array of research fields, ranging from linguistics to scientific documentation and data automation. The volumes related to archaeological research, which were inaugurated by Amilcare Bietti's lectures on applied mathematical and statistical methods (Bietti 1979; 1982), are now available online on the website of the Virtual Museum of Archaeological Computing, a joint initiative of the CNR and the Accademia Nazionale dei Lincei designed to retrace the main theoretical and methodological landmarks of the evolution of computer applications in archaeology, starting from the fifties up to the new millennium (Moscati, Orlandi 2019).²

3 Archaeology ‘Ancillary’ Sciences

At the end of the sixties, chaired by Vincenzo Caglioti, the CNR too promoted and coordinated scientific initiatives on the application of science and technologies to archaeological research, which in those years was undergoing a thorough interdisciplinary methodological review. The progressive acclamation of ‘ancillary’ sciences is upheld by the establishment, in 1967, of a special CNR Commission. Chaired by Paolo Graziosi and coordinated by Giuseppe Donato as its Secretary, in 1970 the Commission launched the Servizio per le scienze sussidiarie dell’archeologia, under the direction of Donato himself, with a specific focus on developing new scientific methods in the field of data acquisition, data analysis and dating techniques (Donato 1969).

Massimo Pallottino’s opinion on this new scientific direction could be summarised as follows: if the whole history of archaeology is featured by the ingenious implementation of new tools and techniques

¹ *Il Centro linceo interdisciplinare “Beniamino Segre”: origini, sviluppo, prospettive*, conference held at the Academy in 2016.

² <http://archaeologicalcomputing.lincei.it/>. The volumes are freely available in the section “Institutions” dedicated to the Centro Linceo.

to support investigation activities, technology progress has now culminated in an 'explosive' climax. The novelty lies in that some tools and techniques are specifically devised for archaeology and applications extend over the entire archaeological research 'cycle', with a massive impact on four fundamental sectors: 1) exploration techniques; 2) data analysis techniques; 3) dating techniques; 4) conservation and restoration techniques (Pallottino 1963, 114-15).

Among the earliest application areas, geophysical surveys captured the interest of archaeologists since its inception in the fifties, especially thanks to the projects led by the Lerici Foundation. The archaeological prospecting unit, inaugurated by the Foundation in 1954, was soon involved in the activities promoted by the CNR and an unprecedented, uniquely Italian, chapter in the history of technology and information science applied to archaeology began. The impressive results obtained in the discovery of Etruscan tombs brought fame and fortune to the Foundation, which cooperated with some of the world's most renowned research centres³ and soon became the focus of media attention, with important implications for the fight against the plague of illegal excavations (Lerici 1962; 1975).

Geophysical surveys also marked the introduction of computers into archaeological research. As Lucia Cavagnaro Vanoni pointed out, the results of the fieldwork conducted in the ancient city of Tarquinia, in an area of 4.5 hectares, were processed by an IBM 7090 in one and a half hour's work, distributed over a week (Cavagnaro Vanoni 1967). Without a computer, data interpolation, mathematical processing and representation would have required at least 18 months.

4 Multiple and Complementary Aspects of an Interdisciplinary Research Approach

Since the seventies, the emergence and evolution of an interdisciplinary approach were conceived as a unifying view of science and culture, often advocated by the humanities side of the scientific research. The term interdisciplinarity did not refer only to the competition between different disciplines, but also to their integration through the identification of common elements, interconnections, and methodological affinities. According to the suggestive definition by Willard McCarty, a "true *interdiscipline* [...] is an entity that exists in the interstices of the existing fields, dealing with some, many

³ The Museum Applied Science Center for Archaeology (MASCA) at the University of Pennsylvania, the Research Laboratory for Archaeology and the History of Art in Oxford, the Centre de Recherches Géophysiques of the CNRS in Garchy, and the Rheinisches Landesmuseum in Bonn.

or all of them. It is the Phoenician trader among the settled nations” (McCarty 1999).

Archaeology, with its solid scholarly legacy, managed to find in the application of the most modern technologies a huge potential for development in each investigation fields pertaining to its knowledge chain. At the same time, it succeeded in remaining faithful to its most intimate purposes – and concerns – consisting precisely in the systematic pursuit of knowledge as a prerequisite for the preservation of those assets that are at the heart of its study (Ferrari 1996).

Beyond any doubt, technologies facilitated and enhanced the nature of archaeological scholarship, which, while retaining its autonomy, moved step by step with the interdisciplinary shift in cultural heritage studies.

4.1 Tradition and Innovation in Archaeology and Cultural Heritage Studies at the CNR

As early as the 1970s, the Servizio per le scienze sussidiarie dell’archeologia expanded its name to include the conservation and enhancement of cultural heritage. Giuseppe Donato, together with Mario Fornaseri, Sebastiano Sciuti and Sergio Terrani, carried out a feasibility study for the setting up of a special project targeting knowledge, safeguarding and enhancing of the artistic heritage through a nationwide coordination activity.⁴

This was the beginning of a long journey the CNR was to embark upon. The timeline represented in the website of the new-born Institute of Heritage Science (ISPC),⁵ inaugurated in 2019, helps to visualise, in a nutshell, the key milestones of this journey, one of which is the launch of the special project on the safeguard of cultural heritage in the nineties (*Progetto Finalizzato* 1996; Guarino 1998). Today, ISPC is the last offspring of the CNR institutional merging policy that has brought together the Institutes with the longest tradition in the fields of archaeological research, technologies applied to cultural heritage, and conservation and enhancement of cultural heritage.

In 2006, during the workshop-exhibition *Multi-quality Approach to Cultural Heritage*, organised by the CNR Cultural Heritage Department,⁶

⁴ Studio di fattibilità del Progetto Finalizzato Scienze sussidiarie dell’archeologia e delle attività per la valorizzazione e la conservazione del patrimonio artistico. Roma: CNR, n.d.

⁵ <https://www.ispc.cnr.it/en/istituto/storia/>.

⁶ The aim of the workshop was to present the latest technologies developed in Italy in the cultural heritage sector, to be then proposed to Japanese companies and institutions during the *Italian Spring in Japan* exhibition organised by the Italian Embassy in Tokyo. The success of the event was repeated shortly afterwards through the *TECHA 2008* workshop (Di Marcello, Cessari 2008).

over fifty projects, subdivided into seven specific subsets,⁷ set out to illustrate the various aspects of the study and preservation of the archaeological, art historical, and documentary heritage. Convergence of purposes and originality of applications strengthened both the harmonious relationship between methodological assumptions and operational practice and the overall involvement of research institutes, universities, public administration and businesses. The 'multi-quality' approach gained wide success also from a terminological point of view: in each presentation, the words multidisciplinary, multi-objective, multimodal, multi-scale, multi-state, multi-criteria, multi-user, multi-channel, besides the well-known multimedia, were widely recurrent.

This was a clear sign of the success achieved by integration and cooperation. In this respect, new methodological trends and investigation strategies were emerging in close connection with the role played by information technology. Its function was to act as a catalyst for interdisciplinary innovation, with a significant impact on traditional research methodologies. The growing nexus of cultural heritage with the history and economy of individual countries was looking at ICT both as a point of reference and a source of innovation in order to amplify its echo in the modern industrialised world.

By the first decade of the new millennium, the interdisciplinary approach was therefore oriented towards the construction of integrated information systems: databases for inventory and cataloguing purposes; geographical information systems for archaeological site location and spatial patterning; network systems as an environment for reference and knowledge sharing; multimedia systems for the communication of research results, using visual and sound information; and visualisation and immersive systems for simulating and representing the lost heritage, allowing a wide community of users to fully enjoy it. Therefore, the digital model – applied both to data acquisition and structuring, and to the formalisation of the analytical processes that allow data to be interpreted – turned into a dynamic representation of a complex reality as opposed to a static procedure of data recording.

4.2 The Centro Linceo and the Formalisation of Knowledge

The Accademia Nazionale dei Lincei played a leading role, along with the CNR, in the dissemination of natural science disciplines, such as biology, chemistry and physics, in the study and preservation of cultural heritage. The international congress *Applicazione dei metodi*

⁷ Knowledge, Diagnosis, Conservation, Enhancement, Management, Enjoyment, and Training. The boundaries between all these sectors were often blurred thanks to the consolidation of integrated and complementary research paths.

nucleari nel campo delle opere d’arte (1976), convened between Rome and Venice in 1973, was the first of its kind throughout the world. As evidence of the attention paid to the constructive dialogue between the members of the scientific and the art historical communities, the event started off with the keynote speech of Beniamino Segre and ended with the concluding remarks of Cesare Brandi. More than a decade later, the memories of that event were still vivid among the interdisciplinary study group that in 1989 published a report on the use of scientific methods in the analysis and preservation of works of art in Italy, with the aim of conducting a fact-finding survey.⁸

The series *Atti dei Convegni Lincei* (and even before the series *Problemi attuali di scienza e di cultura*) are teeming with interdisciplinary initiatives. Of particular note for the archaeological sector are those projects first embracing archaeometry and then archaeoastronomy,⁹ two research fields that have capitalised on the strategic investment in science and technology. Alongside the commitment of the Academy, the Centro Linceo gradually focused on the crucial role of computer science in the academic and social domains, particularly on issues related to computer systems, programming languages, and data models. In this regard, it is worth mentioning the series of seminars on systems science, followed by the conferences on classification techniques and their application in linguistics, computer systems for scientific documentation, automatic information retrieval systems, and expert systems. In 1982, moving from this theoretical and methodological framework, Tito Orlando held a conference focused on computer science and textual scholarship (Orlando 1982).

Ten years later, the seminar *Discipline umanistiche e informatica. Il problema dell’integrazione*, which was mentioned before, gathered a distinguished group of scientists who, while recognising the technical aspects of humanities computing as largely established, gave rise to a cutting-edge debate on the need for developing an embedded scholarly knowledge.¹⁰ Can integration develop further towards

⁸ *La diffusione in Italia delle metodologie scientifiche* 1989. The study group consisted of E. Amaldi, V. Caglioti, G. Careri, S. Carrà, U. Colombo, M. Fornaseri, A. Mottana, S. Sciuti and R. Ugo.

⁹ For the first conferences on these topics, see respectively *Archeometria* 1985 and *Archeologia e Astronomia* 1995.

¹⁰ A lively debate on the meaning of interdisciplinarity has characterised the development of Humanities Computing/Digital Humanities (see e.g. Klein 2015). As part of the long-standing activity of the Humanist Discussion Group, founded in 1987, it is worth quoting, for example, the recent comment by Dino Buzzetti, which summarises efficiently the approach that informs this article: “By necessity, there would be no ‘interdisciplinarity’ without disciplines. Moreover, interdisciplinarity is NOT ‘multidisciplinarity’, for that would be just a juxtaposition of disciplines with no interaction, NOR ‘transdisciplinarity’, for there won’t be disciplines and specific disciplinary competencies anymore” (<https://dhhumanist.org/volume/35/43/>).

unprecedented forms of humanities research? Can knowledge formalisation and mathematical modelling be instrumental in prioritising the interaction and interconnection of different system components?

In close analogy with the spiral approach promoted years earlier by Jean-Claude Gardin (1980), the systems theory, which fits well into the basic principles of cybernetics, describes the interaction between individual components of a system as a filter (typical computer procedure) for which the information extracted or represented by one of the components (output) becomes the input of a subsequent component (see also Orlandi 1999). Comparison and integration are implemented through the evaluation of the methodological renewal of each discipline. Consequently, an epistemological approach to the development of methods and their interaction prevails, in the framework of open systems in which to encode data irrespective of further uses and organise the exchange and interactive use of application tools to be provided in a single environment in which the resources of a 'global library' can be shared.

During the meeting, a novel challenge came into play. While Tito Orlandi made explicit the difference between the two levels of research and data dissemination, Anne-Marie Guimier-Sorbets (1993) introduced the theme of communicating archaeological knowledge. The scholar focused on the need to define and implement standard policies and procedures for information transfer that allow researchers to access and retrieve data from large archives in which information gathered throughout their work is recorded. Following the documentary perspective of databases and focusing on the public aspect of research, Anne-Marie Guimier-Sorbets deemed it necessary to combine the instruments specifically designed for scientific research and those aimed at disseminating knowledge across a much wider audience.

In the same years, in conjunction with the approval of Law 28 March 1991, no. 113 on the dissemination of scientific culture, the Academy was assigned to the coordination of the *Settimana della Cultura Scientifica*.¹¹ Many insightful subjects were on the agenda: the thirst for knowledge, the unification of all branches of knowledge beyond the borders between nations and between generations, European cooperation, the social role of science, the quality control of knowledge dissemination, the use of models to face the challenge of cultural complexity, and the role of museums as an inspiring research environment.

¹¹ *La diffusione della cultura scientifica* 1994; *La diffusione della cultura scientifica* 1996; *La cooperazione europea per la diffusione della cultura scientifica* 1997

5 Computational Models in Archaeology: A Forty-Years Research Path

The research projects I have been carrying out since the eighties at the CNR in the field of computer applications to archaeology are intertwined with the activities undertaken by the Centro Linceo, where their original design took shape. The illustration of some case studies concerning the Etruscan civilisation will help to examine the research evolution in an attempt to unravel its complex unfolding, in which advances in theory and technology are two indivisible facets of the same interdisciplinary approach. Similarly, I will rely on the thirty-year publication of the international journal *Archeologia e Calcolatori* and in particular on a number of special issues focused on scientific and cultural achievements against the background of archaeology and computer science joint evolution.¹²

5.1 Integration as a Multidimensional Approach: The Classification of Archaeological Artefacts

In the eighties in Italy statistical techniques had increasingly gained ground in prehistoric studies, but hardly in classical archaeology. The quantitative approach mostly focused on the typological classification of artefacts and the analysis of their spatial distribution. Inspired by the teaching of Amilcare Bietti and François Djindjian, in the early eighties the research project on the computerised analysis of Etruscan mirrors started out at the Centro Linceo laboratory. In the basement of the Palazzina dell'Auditorio, in the Villa Farnesina complex, an interdisciplinary group of research fellows, working through remote terminals connected to a Sperry UNIVAC 1100 mainframe computer at the data processing centre of Sapienza University of Rome, was involved in a programme focused on the use of computers in the scientific research.

The project soon found recognition in the research line Automatisation of Etruscan corpora at the CNR Centro di Studi per l'Archeologia Etrusco-Italica, under the direction of Mauro Cristofani,¹³ who also

¹² All issues, special issues, conference proceedings, and the supplements series cited in this paper are freely available in the Journal's website: <http://www.archcalc.cnr.it/>. See in particular: http://www.archcalc.cnr.it/journal/year_list.php; http://www.archcalc.cnr.it/pages/special_issues.php; http://www.archcalc.cnr.it/supplements/year_list_sup.php.

¹³ At the time, Mauro Cristofani was deeply involved in the founding committee of the new Faculty of Cultural Heritage Conservation of Tuscany University (Viterbo) and in the fostering of academic policies aimed at training new skilled professional profiles in the cultural heritage domain. On these university-related issues, which go be-

promoted the publication of the first Italian handbook of computing and archaeology (Moscati 1987). The research purpose was to test a computer-based method in order to investigate and classify homogeneous groups of artefacts belonging to the Etruscan civilisation. By using SPSS (Statistical Package for the Social Sciences) and SPAD (Système Portable pour l'Analyse des Données) packages, the research started with the analysis of about 1,000 Etruscan bronze mirrors and continued, in the following years, with the stone cinerary urns produced in Volterra in the Hellenistic period (the *Volaterrae* project). Descriptive statistical techniques helped to sift and provide a detailed picture of each variable, whereas exploratory data analysis techniques were oriented to study patterns and relationships in a heuristic process within which new information on the most distinctive features of each class of artefacts could be inferred.

Statistical analyses on bronze mirrors (Moscati 1984; 1986) yielded interesting results on the frequency and distribution of mythological figures and episodes (the Judgment of Paris, Helen's loves, amorous abductions), as well as on daily life scenes associated with the *mundus muliebris*. In addition, they were conducive to demonstrating the significant relationship between figures coming from both the Greek and Etruscan civilisations, through the participation of typical Etruscan mythological figures in scenes of Greek origin or the transposition of typical Greek deities in local Etruscan myths. By regrouping the mirrors in a series of homogeneous clusters, some suggestions on the spatial and chronological distribution of workshops were also proposed.

In the *Volaterrae* project, descriptive and multidimensional analyses were conducted on about 1,200 cinerary urns (Moscati 1998; 2004). As for the repertory of scenes carved on the front of the chests, both the interrelationship between morphology and iconography and the chronological dissemination of mythological or funerary themes were investigated. The formal description of architectural mouldings – considered in the literature as distinctive trademarks of single workshops – helped to detect some manufacturing techniques relying on the stone-carving of local craftsmen. Quantitative analysis revealed some characteristic elements of the standard production as opposed to the high quality production embellished with framing decorations that bear witness to the will of the deceased to celebrate his/her social and civil function.

This interdisciplinary approach was well suited to giving substance to the theoretical and methodological reflections on the im-

yond the scope of this paper, see in particular the momentous conference organised in Naples in 1991 by Mauro Cristofani himself (Cristofani 1994), in which some topics on computer applications were also addressed.

portance of the individual phases of the archaeological research - the 'statistical cycle', as Clive Orton (1980) defined it - and on the need for their formalisation. This scientific ferment resulted, in 1994, in the publication of the first special issue of the journal *Archeologia e Calcolatori* devoted to *Choice, Representation and Structuring of Archaeological Information*, which opened up an international debate on the identification and structuring of archaeological information and on the definition of a logical model according to which data can be formally represented.

In the same year, Tito Orlando convened a second cycle of seminars at the Centro Linceo under the heading of *Informatica e discipline umanistiche: il problema della formalizzazione* (Orlando 1997), with the aim of exploring whether and to which extent formalisation was conceivable within individual humanities disciplines, also before and irrespective of the emergence of computers and information technology.¹⁴ On that occasion, the statistical classification of archaeological artefacts was pointed out, with specific reference to data sampling and numerical encoding (Moscati 1997). While, according to the traditional approach, the classification of archaeological artefacts relies on comparative procedures, the quantitative approach relies on statistical association and correlation mechanisms. In such a way, integration means that several dynamic models are set in motion, the subsequent stages of which are the endpoints of validation actions culminating in archaeological interpretation. Alongside a first descriptive level of analysis, the use of multidimensional statistical techniques gives rise to an inferential process designed to extract new information and to identify a logical structure that could meet specific criteria, such as those required by the classification and separation of archaeological artefacts.

¹⁴ In this regard, it is interesting to refer to some letters from the unpublished correspondence between Jean-Claude Gardin and René Ginouvès, in which the first of the two scholars insisted on prioritising the method and its theoretical implications, regardless of the underlying physical system (Moscati 2016).

5.2 Integration as the Merging of Archaeological Research Practices

Throughout the eighties, the CNR Institute carried out a series of field surveys and excavation campaigns on the urban plateau of the ancient Etruscan city of Cerveteri, bringing to light several archaeological phases, from the Villanovan to the Roman period. The systematic use of computers gave birth to the *Caere* project, which in the nineties received full approval as part of the CNR Cultural Heritage Special Project. In 1998, the results achieved thanks to an international survey, designed to gather information on the application of Geographical Information Systems (GIS) in archaeology, were published in a special issue of *Archeologia e Calcolatori*.¹⁵ The aim was to illustrate trends and perspectives of this new and powerful information system that had just emerged in archaeology.¹⁶

Building on modern trends of contextual archaeology and relying on the technological challenge of transposing an advanced computer platform into a virtual environment in which to reproduce the archaeologists' work, GIS systems and the underlying georelational data model soon became the instrument to consolidate the central role of spatial data, both on settlement and regional scale. In the case of *Caere*, the GIS environment provided an opportunity to collect data resulting from geophysical and archaeological surveys and from excavation campaigns. Digital Terrain Models highlighted the unique morphology of the southern Etruscan landscape, characterised by isolated tufa plateaux bound by streams and deep ravines. Spatial Analysis techniques helped to study the distribution of finds and features, as well as to investigate spatial and visual relationships between the main buildings on the urban plateau. An archaeo-astro-nomical approach was also applied to study the quite exceptional north-western orientation of the Temple of Vigna Parrocchiale, dating back to the beginning of the fifth century BC, with respect to the monumental tumuli of the Banditaccia necropolis.

Integration is the true novelty introduced by GIS systems. Not only did they act as a repository for methods and models already tested in archaeological computing, but they were expected to perform an interdisciplinary design task, fully responding to the needs of archaeologists, geographers, architects, geologists, and geophysicists. It was the first time in the history of archaeological computing that technol-

¹⁵ "Methodological Problems and Future Perspectives in the Application of GIS in Archaeology", special issue, *Archeologia e Calcolatori*, 9, 1998.

¹⁶ A systematic bibliographic survey, conducted in the following years as a further check, allowed us to closely analyse GIS developments in archaeology (Moscati, Tagliamonte 2002).

ogy succeeded in breaking new ground, introducing an unprecedented theoretical model inspired by global archaeology, combining all available research practices for a thorough investigation of the past.

For these reasons, the architecture of the *Caere* project¹⁷ was presented at the international conference *I modelli nella ricerca archeologica* (2003), which was organised in 2000 by the Centro Linceo and inaugurated by Jean-Claude Gardin's brilliant remarks (Gardin 2003). Our intent was to illustrate the tripartite model we had embraced as a conceptual paradigm: the 'data model', aimed at outlining the structure of archaeological data; the 'theoretical model', aimed at processing the data in order to interpret them; and finally, the 'digital model', aimed at formalising traditional research processes through the interaction of the two above-mentioned models (Moscati 2003).

In addition, the *Caere* project provided a new model for excavation data recording, based on the encoding of the yearly excavation diaries in a hypertext format and aimed at recreating the main phases of the archaeologist's field 'readings' in a digital environment and in an interactive manner, in order to associate both data documentation and data interpretation to the archaeological stratigraphic sequence. The transformation of excavation reports into electronic documents, thanks to the use of markup languages, led to a process capable of semantically encoding the entire excavation activity that had been described in a natural language: the daily account of the excavation process, specific problems to be solved, and suggestions proposed by the archaeologists. After all, it was a formalised experience of storytelling, in which the system had the capacity to recover not only words but also stratigraphic records and conceptual interpretations.

The adoption of the Standard Generalized Markup Language (SGML) and the relevant Document Type Definition (DTD) brings us back, once more, to Orlandi's words in the 1991 conference: a semantic tagging system for data structuring and description, generally applied to text analysis, was the only one capable of exploiting data in highly differentiated research areas. During the conference, for example, a similar approach was illustrated by Manfred Thaller in the historical research sphere (Thaller 1993).

¹⁷ For the methodological and technical aspects of the project, see the insert published in vol. 12 (2001) of the journal *Archeologia e Calcolatori*, with an introduction by P. Moscati (2001) and contributions by I. Bonincontro, C. Barchesi, S. Mariotti and L. Ceccarelli: <http://www.archcalc.cnr.it/journal/idyear.php?IDyear=2001-01-01>.

5.3 Integration as a Way to Interactivity, Hyper-mediality, and Connectivity: The Dissemination of Archaeological Knowledge

The *Caere* project opened up a new research season fostering and enhancing the relationship between archaeology and the 'information society'. In the annual research conference jointly organised by the Academy and the CNR in 1996, one of the roundtables addressed the theme of *Multimedialità, tecnologia, società* (Orlandi 1998), fostering a new concept of multimedia systems, as an unprecedented environment where computer science did play a central role not only in media integration, but also in scholarship integration.

In archaeology, multimedia systems were reported as being mainly oriented towards document integration, encouraging cross-reference reading, establishing information interconnection, as well as enhancing the audio-visual experience. Hypertext representation provided an intellectual innovative niche in the context of interactive technologies: dynamic models for data storage and retrieval were fostered, and interactive visualisation techniques, capable of creating and animating real-time 3D environments, were soon deployed in an interdisciplinary endeavour, supported by specialists in neuroscience and cognitive science alike.

The concept of languages, as formal models designed to represent archaeological data, was consolidated and its relevance became self-evident in all sectors of computer applications. In the information society, languages used in cultural communication should embrace three key concepts: interactivity, hyper-mediality, and connectivity. In addition, web-based technologies should be directed towards a process of integration into a global system of data representation and knowledge 'socialisation'. In 2004, the research team of *Archeologia e Calcolatori* launched a call for papers for a new special issue with a self-revealing title: "New Frontiers of Archaeological Research: Languages, Communication, Information Technology". The call, which was widely recognised within the international scientific community, read as follows:

The problem of language, together with that of descriptive standards, which characterised the pioneering work of scholars who approached the computer recording and classification of archaeological data, is significantly back under discussion in light of today's consolidated growth of multimedia communication, which takes full advantage of the web as a transmission tool and makes use of international standards for data encoding, thus solving old problems in innovative ways.

The organisation of the special issue into six sections reflected a new scholarship systematisation: i) writing or rewriting archaeology; ii) languages, standards and metadata; iii) data encoding, formalisation and analysis; iv) between time and space; v) from reality to virtuality; vi) communicating archaeology through the web. Formal languages and metalanguages were undoubtedly the predominant theme upon which contributions were centred. Thanks to the publication of over thirty papers, the debate evolved in parallel: the interaction between theoretical thinking and data processing techniques; the relationship between natural and formal languages in the analysis of archaeological data; the role of languages to simultaneously provide for the encoding, interaction, exchange, transmission and exploitation of archaeological data, as a vehicle for transforming documents into a source of structured and integrated information.

At the onset of the new millennium, the end results of the *Caere* project – in particular the cognitive aspects of electronic text processing and the impact of interactive multimedia strategies – led us to closely investigate two separate research foci: the role of digital repositories in the cultural heritage setting and the impact of archaeological data dissemination and sharing. Once again, the first focus was intertwined with the activities carried out by the Centro Linneo. In the framework of the international conference *Archivi informatici per il patrimonio culturale* (2006), the information recording of and extraction from unstructured or semi-structured archaeological texts (Moscati 2006) answered well the question on the difference between born-digital record collections and documents that need a smooth transition from the 'identification of the document' – i.e. the recognition of its nature – to its storage in digital form (Orlandi 2006).

As for the use of interactive multimedia techniques, not only for research purposes but also for data dissemination in virtual environments, in 1997 the journal *Archeologia e Calcolatori* inaugurated the supplement series with a specific research theme on "Virtual Museums and Archaeology", in order to evaluate and test the effects of Virtual Reality techniques on cultural transmission and education. As part of the CNR activity, and as a sign of our genuine commitment towards virtual musealisation, a project dedicated to reunification and recontextualisation of the grave goods found in a princely tomb of the Sabine necropolis of Colle del Forno was illustrated (Emiliozzi, Moscati, Santoro 2007).

The tomb was excavated in the early seventies and shamefully was found already looted. The grave goods – at the time exhibited in two different Museums, the Ny Carlsberg Glyptotek in Copenhagen and the Fara in Sabina archaeological museum, and now returned to Italy – were fully recontextualised. Moreover, the virtual restoration and the 3D representation of the princely cart, with its magnificent bronze sheets, allowed us to work in a virtual laboratory, replicating the workshop of an ancient craftsman, and to show the

beauty of this masterpiece, dating back to the end of the seventh century BC. This working environment fulfilled both scientific enquiry and dissemination purposes, taking into account expert scholars and visitors’ requirements alike.

6 Digital Archaeology and Heritage Science

The application of standards, metadata and markup languages to managing, preserving, and giving continuous access to electronic resources drew our attention to the cyberspace, where contents can be re-conceived in accordance with communication and education strategies. As a consequence, two broader projects were launched with the idea to fully integrate them with key research policies and development areas that feature the future progress of digital archaeology.

6.1 The Open Science Paradigm

In 2005 *Archeologia e Calcolatori* joined the Open Archives Initiative (Barchesi 2019). Over time, the choice to provide a scholarly forum for promoting Open Science has allowed the journal to offer a better insight into the nature of data and its interoperability and to foster the sharing of archaeological open data collections in a digital environment. Today, the Journal is an active protagonist in the debate on FAIR and LOD principles, cooperating in initiatives aimed at aggregating cultural and scientific digital contents, such as CulturalItalia and Europeana. Since December 2020, the Journal is also data provider of OpenAIRE, the Open Access Infrastructure for Research in Europe (Piergrossi, Rossi 2019).

This approach, currently supported by the CNR-ISPC research group supervising the Open Data, Open Knowledge, Open Science Laboratory,¹⁸ blends with the recent trend of merging digital archaeology into the broader scope of Digital Cultural Heritage and Heritage Science,¹⁹ with the general aim of creating common platforms – or infrastructures – in which to share data, digital tools and services. Archaeology is thus moving towards embracing the solutions envisaged at national and European level for the digitisation of cultural heritage, with the aim of achieving common objectives and planning a census and preservation programme.

¹⁸ https://www.ispc.cnr.it/it_it/2020/05/14/gruppo-open-data/.

¹⁹ The term was first introduced in 2006: Science and Heritage, 9th Report of Session 2005-06, House of Lords, Science and Technology Committee, HL Paper 256 (<https://publications.parliament.uk/pa/ld200506/ldsctech/256/256.pdf>).

In order to facilitate interoperability between existing open digital repositories, European e-infrastructures are designed to intensify the dissemination and sharing of large integrated datasets – in essence the ‘big data movement’ – recorded over a long period of time and stored in ad hoc digital repositories. Open Science, therefore, is a ‘multidimensional’ challenge, whose goal is to unify, or merge, diversified resources by employing integrated approaches and competencies, in accordance with some research priorities that are often set out at governmental level with a keen eye on the stakeholders’ needs and financial priorities.

6.2 Public Archaeology and the Education Strategies

Since 2010, we have concentrated on a research project dedicated to the History of Archaeological Computing. The idea behind this project took shape during the international symposium *La nascita dell'informatica archeologica*, held in Rome at the Accademia Nazionale dei Lincei in 2008 and published in the 20th issue of *Archeologia e Calcolatori*. The Virtual Museum of Archaeological Computing, jointly promoted by the CNR and the Accademia dei Lincei, is currently in progress with the specific aim of reflecting upon the history of archaeological computing, going back to the earliest applications and reassessing their theoretical basis, which had been overshadowed by the exponential growth of technology.

The aim of the Museum is to give access to published and unpublished resources (archival documents, bibliographies, specialised books and series, reports, interviews...) that can shed light on the association between computing and archaeology from an epistemological perspective. The project has already been widely illustrated, with all its theoretical and methodological implications and a special focus on the documents coming from the Fonds Jean-Claude Gardin kept in Nanterre at the Service des Archives of the Maison Archéologie et Ethnologie, René-Ginouvès, now Maison des Sciences de l'Homme Mondes (Moscati, Orlandi 2019).²⁰

What we want to emphasise here is the educational function of the museum environment, in which we have been directly involved in an attempt to provide a new narrative, unfolding along interactive itineraries. Great importance is placed on educating young people on the systematic use of electronic resources freely accessible on-

²⁰ The web pages dedicated to Jean-Claude Gardin in the virtual museum give access, among other documents, to the reports on the establishment at the end of the fifties of the Centre Mécanographique de Documentation Archéologique, then Centre d'Analyse documentaire pour l'archéologie (Moscati 2013).

line and on the critical assessment of current audience development strategies planned to enhance the relationship between cultural organisations and a wider public, being it defined as public archaeology, community archaeology, participatory archaeology or, more in general, citizen humanities.²¹

Some multimedia itineraries, all under the umbrella of a major container entitled *Engaging Young People: Social Media, Interactivity and Museums*, focus on their involvement in cultural activities.²² Texts were written by students at classical high schools and by undergraduate students, who were asked to reflect upon the usefulness of interactive tools in museums (digital platforms, video applications, archaeogaming) and on the role of social media as a successful method for audience capture and development. This experiment has laid the foundations for a new research proposal, intended to create customised educational paths, supporting distance learning programmes and promoting knowledge sharing and enjoyment. By encouraging a dialogue between young people and the research community, specific attention has been paid not to stifle students' knowledge but to familiarise them with the Open Science paradigm.

7 Conclusion

Today, digital archaeology is strictly associated to the routine adoption of cutting-edge technologies and to the pervasiveness of digitisation strategies in all phases of archaeological investigation (Djindjian 2019). Therefore, it is primarily aligned with technological advances and fully in harmony with the European advisory policy to develop Digital Cultural Heritage initiatives and to improve STEM (Science, Technology, Engineering and Mathematics) skills in the cultural heritage domain.

As we have illustrated in the previous sections, the role of 'integration' was at the heart of archaeological computing, while the concept of 'fusion' has spread in recent years as a global resource management model, which combines the methods of archaeology with the objectives of Heritage Science and with a focus on digital and public humanities. Whenever the term fusion is used to reinforce the concept of complementarities between disciplines, archaeologists can be considered among the protagonists of this transformation that pro-

²¹ According to Heinisch 2020 "While the digital humanities provide the citizen humanities with data, tools, techniques and infrastructures [...] the public humanities offer the means of communication and ways of engaging diverse publics in research activities" (144).

²² The itinerary is published in the following section: <http://archaeologicalcomputing.cnr.it/itineraries/category/techniques/>.

motes a new ‘infrastructure’ philosophy, based on integrated systems that embody the responsible planning and management of common resources (Wright, Richards 2018).

Computational archaeologists, as other digital humanists, have a much more difficult task to perform than in the past as they are supposed to facilitate the dialogue between experts, to introduce new research objectives, to become software engineers, and to assume a preeminent role in society, with a careful eye on preservation and prevention. As a consequence, they will increasingly deal with new paradigms, in which Artificial Intelligence and Machine Learning algorithms are deployed within large-scale research infrastructures.

Overall, this process of blending disciplines is such that cultural and economic outcomes will likely be impressive. Nonetheless, the scholarly boundaries – whether they relate to archaeology or computational archaeology – are progressively blurring. Therefore, a careful attention should be drawn to the risk of creating an “impoverished uniformity of interdisciplinarity” (Liu 2008, 178) and, at the same time, a serious and misleading gap between archaeological research that is increasingly fine-tuning its own methods, and data storing, sharing and dissemination that are expanding the network of knowledge.

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‘I’m your automatic colour’ La colorazione automatica delle immagini in antropologia

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Abstract Colour photographs now represent almost all the images produced with the new reality capture tools, mobile phones, which in 2020 ‘took’ 90% of all photos of that year. Black and white is relegated to artistic expression, even newspapers have converted to colour for some years. In the history of photography, although research on colour is attempted from the early stages, it is necessary to wait until 1861 with the experiences of James Clerk Maxwell who created a stable colour image. However, it is from the fifties of the twentieth century that the use of colour becomes ‘popular’ even in a more aesthetic dimension than an objective reproduction of reality. Part of the ethnographic, anthropological, archaeological and field research, on the other hand still makes use of consolidated and inexpensive black and white for a long time. On these images largely available online and open source you can conduct automatic colouring experiences. The procedure, managed with *artificial intelligence* algorithms with *deep learning* processes, is always more widely used with free applications and allows to obtain qualitatively more and more relevant results, even if some critical analysis is still necessary. This article presents the state of the art to 2021 of automatic colouring, with the comparison between algorithms developed since 2016 and showing with experimental examples both the possibilities of rendering and even the critical issues that emerged with the application in anthropological photographs, with the aim of extracting information that is not very evident in the originals in black and white.

Keywords Photography. Colour. Artificial intelligence. Fashion. Anthropology.

Sommario 1 Punto zero. – 2 Analogica. – 2.1 Idee. – 2.2 Colore da manuale. – 2.3 Cartoline dal passato. – 3 Digitale. – 3.1 Algoritmi. – 3.2 Letteratura. – 3.3 Colori. – 3.4 Moda. – 3.5 Albania. – 4 Conclusioni.

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1 Punto zero

La nascita della fotografia a colori, con risultati compiuti, si colloca circa al 1861 con le esperienze di James Clerk Maxwell e i successivi e rapidi miglioramenti e semplificazioni del processo. È tuttavia necessario attendere quasi un secolo, tra gli anni Cinquanta e Sessanta del Novecento, perché questa tecnica divenga popolare. Se in alcuni campi l'uso del colore è stato più frequente - reportage geografici, servizi di guerra, pubblicità - la ricerca etnografica, antropologica, archeologica si è avvalsa per lungo tempo solo del bianco e nero, consolidato e poco costoso. Oggi sono presenti in raccolte, musei, collezioni corpus di milioni di scatti in bianco e nero - sempre più di frequente digitalizzati e diffusi con licenze *open source* - che possono essere analizzati ed elaborati per ricerche originali. Lo sviluppo sempre più deciso dell'*artificial intelligence* con processi di *deep learning*, in programmi efficaci quanto semplici disponibili anche su cellulari, permetterebbe di procedere alla colorazione automatica delle raccolte, pur se molti degli approcci alla colorazione vertono sull'estetica dell'immagine. Questo articolo presenta e analizza le possibilità e i limiti della colorazione automatica delle immagini applicata all'ambito antropologico - con cenni agli aspetti tecnici e a temi legati all'estetica della fotografia a colori - mostrando risultati sperimentali e evidenziando sia le possibilità di resa sia le criticità emerse, riflettendo sull'utilizzo delle foto, una volta colorate, per l'estrazione di informazioni poco evidenti negli originali in bianco e nero.

2 Analogica

2.1 Idee

Lo sviluppo storico della fotografia non è un processo lineare. Se il principio della *camera oscura* era noto sin dall'antichità, ricerche sui materiali sensibili alla luce in grado teoricamente di fissare un'immagine presero il via dall'inizio del Settecento, con un'indagine accurata dei processi chimici che vi soggiacciono. Gli studi poi dell'inglese Thomas Wedgwood tra la fine del Settecento e i primissimi anni dell'Ottocento con l'uso del nitrato d'argento per la cattura di immagini (su supporto cartaceo e cuoio) aprirono la strada ad approfondimenti con la successiva circolazione di primi studi (Wedgwood, Davy 1802) che permisero ulteriori indagini. Il francese Joseph Nicéphore Niépce indagò la chimica dei materiali sensibili verificando la possibilità di ottenere immagini stabili nel tempo - aspetto che Wedgwood non aveva preso in considerazione - e sviluppò con l'*eliografia* un metodo di riproduzione delle immagini, derivate da incisioni o ripre-

se dal vero. La sua prima fotografia conservata risale al 1826 e mostra ciò che l'autore vedeva dalla finestra del suo studio a Le Gras: la strada e gli edifici circostanti, in un'esposizione di almeno otto ore. I contatti a partire dal 1827 con Louis Daguerre consentirono la definizione compiuta della fotografia, con ricerche comuni interrotte nel 1833 per la morte di Niépce. Daguerre proseguì e ottenne immagini sempre migliori, sia nella definizione sia soprattutto nella stabilità, arrivando il 9 luglio 1839 a ricevere dall'Académie des sciences de l'Institut de France di Parigi il riconoscimento ufficiale del suo procedimento: la *dagherrotipia*. Si trattava di immagini in bianco e nero, tuttavia il dibattito sull'ottenimento di fotografie a colori, rispondenti cioè alla realtà, non venne posto in secondo piano. Nel dossier pubblicato per l'illustrazione del procedimento all'Académie (Daguerre 1839) - con interventi di altri ricercatori oltre che dello stesso autore - il tema del colore venne più volte discusso, valutando che in quel momento l'impossibilità di avere immagini rispondenti alla realtà era solo un limite tecnico considerato superabile.

Scrive Louis Arago:

Sarebbe certamente azzardato affermare che i colori naturali degli oggetti non saranno mai riprodotti in immagini fissate dalla luce. (Daguerre 1839, 28)¹

E ancora Joseph Gay-Lussac:

L'immagine con colori naturali e ben definiti rimarrà a lungo, forse per sempre, una sfida alla sagacia umana. Ma non dobbiamo avere l'imprudenza di fissargli limiti invalicabili; i successi di Daguerre scoprono un nuovo ordine di possibilità. (Daguerre 1839, 32)²

Si sottolineano infine i limiti oggettivi legati a una diversa *percezione e resa* del colore; ancora Gay-Lussac:

Tuttavia, non va dimenticato che gli oggetti colorati non vengono riprodotti con i propri colori e che poiché i differenti raggi di luce non agiscono allo stesso modo sul reagente del signor Daguerre, l'armonia delle ombre e delle luci negli oggetti colorati è necessa-

¹ «Il serait certainement hasardé d'affirmer que les couleurs naturelles des objets ne seront jamais reproduites dans les images photogéniques» (Daguerre 1839, 28). Le traduzioni sono di A. Bartolini.

² «L'image a couleurs naturelles et variées restera longtemps, à jamais peut-être, un défi à la sagacité humaine. Mais n'ayons pas la témérité de lui poser des bornes infranchissables; les succès de M. Daguerre découvrent un nouvel ordre de possibilité» (Daguerre 1839, 32).

riamente alterata. Questo è un punto fermo riconducibile alla natura stessa del nuovo processo. (Daguerre 1839, 33)³

I fisici e chimici Arago, Gay-Lussac e Davy (che si era occupato degli studi di Wedgwood) erano attenti agli aspetti formali del nuovo metodo, su come la realtà poteva essere restituita in modo *oggettivo*: le loro riflessioni sulla fotografia sono di rilievo, perché già in origine ne scardinavano il confronto con la pittura, che si indirizzava a muoversi sul piano del colore in modo *soggettivo*, aspetto che la nuova arte dell'Ottocento, come l'impressionismo, evidenzia bene. I limiti intravisti da Gay-Lussac erano legati ai metodi di restituzione dell'immagine, alla chimica, ma evidenziano un tema non marginale della fotografia a colori, oggi nella sua restituzione tramite processi di *artificial intelligence*, ossia la 'verosimiglianza', nella direzione di un colore sempre più 'reale'.⁴

Questo aspetto non è secondario in un ragionamento più ampio sull'immagine: le prime pubblicità, almeno in Italia, dei televisori a colori, sia sulla carta stampata sia sullo stesso *medium*, tra gli anni Settanta e Ottanta del Novecento, puntavano a sottolineare come la resa dei colori fosse totalmente fedele alla realtà, indirizzandosi, ad esempio, come la marca Seleco, su «il colore della verità»⁵ o come il noto slogan della Philips «colore sempre vivo» e Rex «Realcolor».⁶ Il tema del colore si prestò rapidamente a una diffusione popolare, al di là delle strette analisi tecniche, inquadrandosi nella possibilità di avere immagini stabili e a un costo accessibile: sin dalla seconda metà degli anni Cinquanta dell'Ottocento, riviste generaliste diedero con una certa frequenza notizie sui nuovi progressi di questa tipologia di fotografia. A titolo di esempio, anche per la precocità, vediamo dalla *Rivista friulana. Scienze Arti Industrie Commercio* dell'aprile 1859 un cenno in merito:

Se dobbiamo credere al *Cosmos*,⁷ da cui la riprodussero i nostri giornali, la scoperta della Fotografia a colori non è più un desiderio ma una realtà. Infatti, Blackshell in Inghilterra scoprì un processo per

³ «Cependant, il ne faut pas oublier que les objets colorés ne sont point reproduits avec leurs propres couleurs, et que les divers rayons lumineux n'agissant pas de la même manière sur le réactif de M. Daguerre, l'harmonie des ombres et des claires dans les objets colorés est nécessairement altérée. C'est là un point d'arrêt tracé par la nature elle-même au nouveau procédé».

⁴ In una visione scientifica del colore non vanno dimenticati gli studi di Johann Wolfgang von Goethe che nel 1810 pubblica *Zur Farbenlehre*, in contrasto con le teorie di Isaac Newton, ma allo stesso tempo in un quadro più generale di dibattito nelle scienze.

⁵ Per una raccolta di immagini di pubblicità di televisori a colori in Italia nel 1976, cf. <https://www.youtube.com/watch?v=oCynqhsu0uc>.

⁶ <https://www.youtube.com/watch?v=DgGMZeFlpt4>.

⁷ *Chromo-photographie*, rubrica *Nouvelles de la semaine*: «Cosmos. Revue encyclopédique hebdomadaire des progrès des sciences et de leurs applications aux arts et à l'industrie», Tome treizième, 1858, 2° sem., p. 389.

cui s'ottiene una pruova fotografica colorata perfetta. Hill ha così trovato un rivale ed un emulo in Inghilterra [corsivo nell'originale]. Il primo ha ottenuto un brevetto da quella Regina. – A dir vero è una scoperta curiosa, e su cui possiamo dubitare. («Uno sguardo» 1859, 116)

L'articolo, che traccia un quadro degli sviluppi della fotografia, prosegue indicando criticamente come la fotografia a colori debba essere ancora lontana, stante le necessità di sistemi di lenti complessi e di nuovi e migliori materiali sensibili. Abbiamo riportato la notizia da questa fonte per due ordini di motivi. Il primo è legato alla natura del settimanale – pubblicato a Udine, in lingua italiana tra il 1859 e il 1866 come foglio ufficiale della Camera di commercio e industria del Friuli – che operava in un bacino di lettori specialistico, attento agli sviluppi tecnico-scientifici di respiro internazionale. Il secondo fa riferimento all'inventore del procedimento. La stessa notizia venne riportata in altri giornali italiani (sin dal 1858) e in Gran Bretagna, ma né il signor Blackshell né il sistema della cromo-fotografia ebbero valida diffusione. Si tratta di una sperimentazione che non ebbe risultati pratici. Non è l'unico: il citato americano Levi Hill, attorno al 1850, sviluppò un complesso processo che gli fruttò accuse di aver falsato i risultati, pur se in realtà aveva ottenuto alcune immagini ponendosi tra i primi pionieri della fotografia a colori.⁸

In chiave più generale si potrebbe riflettere su come il dibattito e gli sviluppi tecnici che hanno portato all'elaborazione del colore nelle immagini analogiche siano temi di modesto significato per i fini di questo saggio, dato che le esperienze qui illustrate hanno necessità di immagini non colorate. Tuttavia, questi aspetti non sono marginali per una corretta valutazione dell'ambito in cui la colorazione automatica si può muovere, perché se le foto in bianco e nero sono la base del lavoro, la loro collocazione nel reale è il primo passo per una corretta restituzione automatizzata. La tecnica diventò matura tra la fine degli anni Cinquanta e i primi Sessanta dell'Ottocento, quando il fisico scozzese James Clerk Maxwell ne pose le basi teoriche, arrivando nel 1861, con il fotografo Thomas Sutton, alla realizzazione pratica, pur con un'immagine effimera proiettata, stampata solo negli anni Trenta del Novecento da Douglas Arthur Spencer. Daguerre nel 1839 pose come sottotitolo alla descrizione del suo metodo fotografico, una specificazione di rilievo:

Questo processo (il dagherrotipo) consiste nella riproduzione spontanea delle immagini della natura ricevute in camera oscura, non

⁸ Si veda la voce «Levi L. Hill» (Guadagnini 2011, 94-9), con alcuni esempi di fotografie. Hill nel 1856 aveva pubblicato un saggio sulle sue ricerche: *A Treatise on Heliochromy; or the production of pictures, by means of light, in natural colors.*

con i loro colori, ma con una gran finezza di gradazioni di tonalità. (Daguerre 1839, 57)⁹

Nel testo il francese si premura di evidenziare come la realtà non fosse mostrata nei suoi veri colori, bensì con un sistema di sfumature, di gradazioni (i toni di grigio, non la dualità bianco e nero usata per comodità linguistica) che si approssimavano all'immagine percepibile, vista dall'occhio umano. Si potrebbe considerare come, per paradosso, l'immagine fotografica in bianco e nero si avvicini alla realtà più di quella a colori, perché l'insieme delle sfumature restituisce in modo fedele la *struttura* dell'oggetto fotografato. Il passaggio al colore deve produrre un ulteriore salto di approssimazione, deve cioè aggiungere alla tessitura dell'immagine la colorazione, in un'integrazione che non è solo tecnica, anzi, che si proietta in un complesso modello di *descrizione* e *analisi* della realtà. Il processo di colorazione automatica deve tendere proprio a questo, a riportare l'immagine al suo contesto «naturale», evidenziando quegli aspetti che il bianco e nero ha ridotto o camuffato o per limiti tecnici escluso, come le lunghezze d'onda del rosso nel materiale sensibile ortocromatico.

2.2 Colore da manuale

Un manuale italiano sulla fotografia, uscito nel 1955, dal titolo *Come fotografare a colori*, di Gualtiero Castagnola (che riprende il tema in un successivo lavoro, *Guida alla fotografia a colori* pubblicato nel 1966) illustra in modo didattico la complessità dell'immagine a colori, evidenziando come ci sia una notevole differenza formale tra fotografare in bianco e nero e farlo a colori, proprio per i modelli di rappresentazione della realtà. Facciamo riferimento a questa pubblicazione, perché gli anni Cinquanta-Sessanta rappresentarono, in Italia, il punto di svolta della tecnica fotografica a colori, verso una trasformazione popolare, e qui questi passaggi sono illustrati in modo chiaro. Il lavoro è molto puntiglioso, sia sulla tecnica sia su un'analisi più estetica dell'uso del colore, e offre spunti di riflessione su cosa sia il colore nella fotografia e su come questo muti la visione del mondo, aspetti che possono incidere sull'analisi della colorazione automatica. L'autore, fotografo milanese e teorico della fotografia, analizzando il colore si muove su due piani: uno dato da considerazioni estetiche nell'ambito del bello e uno sui temi dell'oggettività del medium, ossia l'immagine a colori fissa la realtà tale e quale.

⁹ «Ce procédé (le daguerréotype) consiste dans la reproduction spontanée des images de la nature reçues dans la chambre noire, non avec leurs couleurs, mais avec une grande finesse de dégradation de teintes».

Si riporta il primo aspetto:

È fuori dubbio che la fotografia a colori stia diffondendosi, proprio in questi anni, nel cerchio degli appassionati e che vada sempre più raccogliendo nuovi proseliti grazie alle infinite soddisfazioni che le riproduzioni colorate, intese in senso generale, sanno dare all'occhio, alla fantasia ed al gusto dell'uomo. È ovvio che tutto ciò che è colore colpisca la nostra sensibilità percettiva: osserviamo un neonato alle prime impressioni; di fronte a tanti oggetti, egli rimane colpito inizialmente da quelli dotati di tinte più vivide e sgargianti. Ma anche noi grandi dobbiamo confessare che, indipendentemente da ogni considerazione critica, proviamo una sensazione piacevole di «bello» quando veniamo a trovarci di fronte ad una composizione colorata sia essa naturale (paesaggio, fiori, frutta ecc.) sia artificiale (stoffe, dipinti, giochi di luce policroma in spettacoli teatrali ecc.). (Castagnola 1955, 7)

Segue il secondo aspetto:

Esaminiamo ora l'effetto che ci dà una bella fotografia a colori: in essa rileviamo, come in bianco e nero, una esatta riproduzione meccanica, ma in più un altro elemento, per l'appunto il colore, che aggiunge una nuova nota estetica, una nuova dimensione, che in effetti riesce a dare un'impressione di completo e di definitivo: il soggetto riportato è «come» il nostro occhio lo vede in realtà: non v'è più nulla d'aggiungere, il ciclo, ripetiamo, è chiuso. Ed è questo in verità il lato negativo. [...] A noi interessa per il momento trarre spunto da quanto abbiamo espresso qui sopra onde mettere in luce, fin dall'inizio, quello che, giustamente, deve essere considerato il più grave difetto che può avere una fotografia a colori: di apparire in tutto e per tutto una cartolina colorata, di quelle che, con trenta lire si comprano dal tabaccaio. Le quali hanno appunto la prerogativa di sfruttare il colore unicamente come elemento complementare di abbellimento (o di abbruttimento) mentre noi dovremo imparare a sfruttare il colore nelle nostre fotografie esclusivamente come elemento di composizione, fine a se stesso, come elemento interpretativo, il che significa: fotografare non il soggetto in quanto colorato ma insieme di colore in quanto soggetto. (Castagnola 1955, 9-10)

I modi legati a come la fotografia a colori possa rappresentare la realtà, che non è una semplice cartolina colorata, sono maggiormente approfonditi nel manuale del 1966:

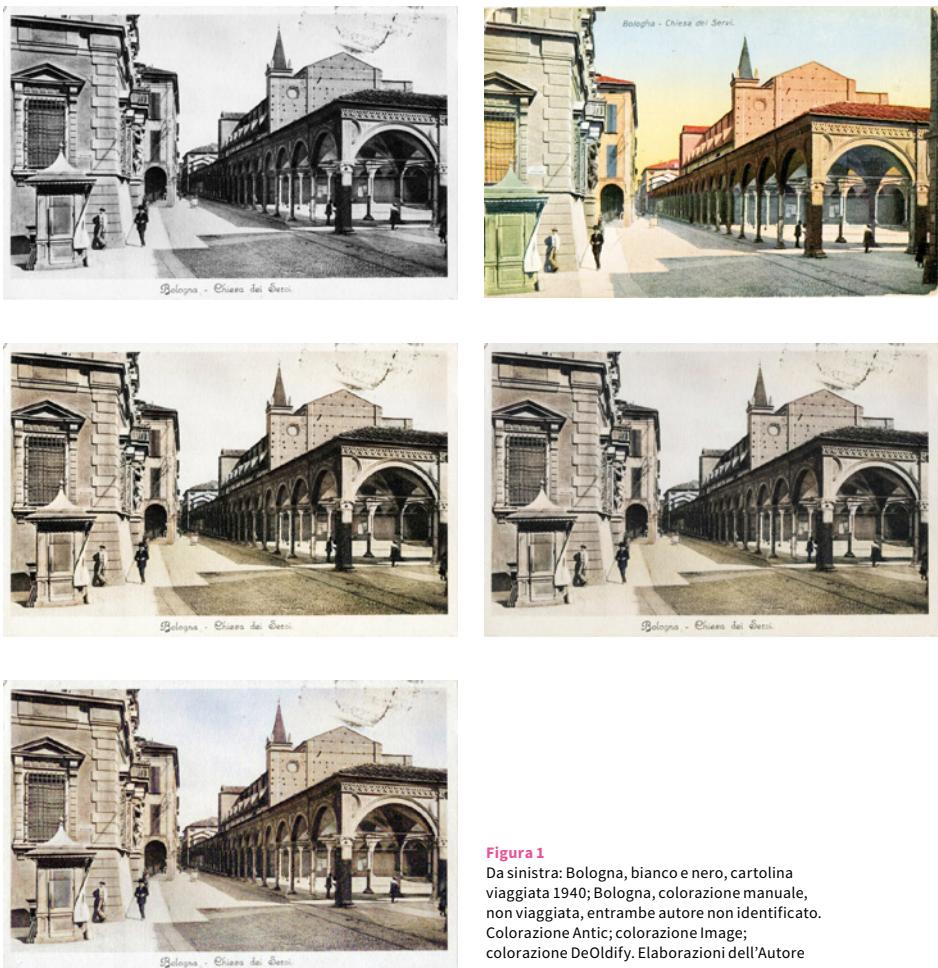
il miglioramento tecnico e l'aumentato grado di sensibilità raggiunto dalle moderne pellicole a colori, i perfezionamenti mecca-

nici ed ottici e gli automatismi introdotti negli apparecchi fotografici, che ne hanno facilitato l'uso, hanno enormemente contributo ad aumentare la diffusione e la popolarità della fotografia a colori in vaste masse di pubblico. (Castagnola 1966, 5)

La preoccupazione dell'autore è che il colore *tout court* restituisca la realtà in forma banalizzata, in una mera riproduzione di quanto osservato. Questo aspetto è significativo: la colorazione automatica deve proprio indirizzarsi verso il banale quotidiano, di non facile ottenimento. Altri manuali coevi approfondiscono in maniera più articolata il significato della fotografia a colori, in una visione più possibilista della rappresentazione del reale (Feininger 1962), pur inserendo valutazioni estetiche (Marin 1957).

2.3 Cartoline dal passato

Un passaggio che Castagnola evidenzia in entrambi i suoi manuali, espresso anche da Corrado Marin nel 1957 (*La presa fotografica a colori*, con un titolo già fuori dal tempo) è che il colore sia spesso un «abbellimento» dell'immagine, che nulla di artistico aggiunge alla fotografia, che riporta proprio la *realità* così come è, grave smacco per il fotografo moderno. In questo contesto gli aspetti estetici si insinuano in modo deciso, nella misura in cui la foto colorata deve suscitare meraviglia per il suo stato più che per il soggetto. Tra gli strumenti di colorazione, prima del consolidamento della tecnica, il più semplice era l'aggiunta manuale del colore. Già alcune lastre del citato Levi Hill mostrano correzioni di questo tipo. Il sistema venne utilizzato in passato in gran copia per le cartoline, dove il colore era un *plus* atto ad aumentare il valore turistico della località. Queste immagini, nella doppia versione di bianco e nero e colore manuale sono utili per una valutazione delle procedure di colorazione automatica, perché ci mostrano con l'immagine colorata, pur artefatta, una *verosimiglianza* alla realtà ritratta nelle foto in bianco e nero, permettendoci una più puntuale analisi e calibrazione dei risultati, con la premessa che la colorazione manuale sia stata condotta con un'osservazione di quanto ritratto. Vediamo alcuni esempi. Le prime due immagini mostrano a Bologna il Portico dei Servi, la chiesa di Santa Maria dei Servi e Palazzo Davia Bargellini, in Strada Maggiore, una in versione bianco e nero e una colorata manualmente, identiche - salvo una modifica di taglio nella parte sinistra - risalenti circa agli anni Trenta del Novecento (una delle due, quella in bianco e nero, è spedita nel gennaio 1940) [fig. 1].

**Figura 1**

Da sinistra: Bologna, bianco e nero, cartolina viaggiata 1940; Bologna, colorazione manuale, non viaggiata, entrambe autore non identificato. Colorazione Antic; colorazione Image; colorazione DeOldify. Elaborazioni dell'Autore

L'immagine dipinta a mano presenta, anche per chi non conosce il luogo, colori, pur enfatizzati, ragionevoli, credibili. Ciò significa che possiamo far fede sull'immagine: la zona, il complesso dei monumenti, si presentava negli anni Trenta del Novecento proprio così. E così si presenta oggi, con poche differenze cromatiche: la colorazione condotta manualmente è *reale*. Questi aspetti ci permettono di usare l'immagine come campione valido per tentativi di colorazione automatica. Il soggetto si è rivelato per la colorazione molto ostico, portando, con diversi algoritmi, a risultati non soddisfacenti, con una totale uniformazione dei colori. Prove condotte su altre immagini,

simili a quelle di Bologna, cartoline in bianco e nero e colorate a mano, hanno dato risultati più attendibili [fig. 2]:¹⁰



Figura 2 Da sinistra, Ronta (FI), cartolina anni Cinquanta bianco e nero; cartolina anni Cinquanta colorata a mano, entrambe autore non identificato. Colorazione Zhang; colorazione Iizuka. Elaborazioni dell'Autore

I motivi che portano a risultati così dissimili vanno ricercati in primo luogo nell'addestramento degli algoritmi. Le foto architettoniche o più in generale urbane mostrano un'uniformità cromatica che non permette scelte precise, sia nei singoli elementi sia nel contesto, per cui l'identificazione e colorazione portano a un'interpretazione 'piatta', come se non ci fosse differenza tra i materiali costruttivi e le decorazioni. Nelle cartoline, dove c'è invece anche il paesaggio, l'architettura è meglio contestualizzata e pur in una certa uniformità, migliorata dalle ombre, si vedono differenze. In un più ampio quadro di colorazione guidata, in questo caso manualmente, in altri più recenti tramite programmi di fotoritocco con intervento dell'operatore, si è diffusa la tendenza alla colorazione di immagini legate agli

10 Ringrazio Luca Varlani per aver messo a disposizione queste immagini dalla sua collezione.

eventi bellici, sia per la Prima che la Seconda guerra mondiale, soprattutto negli Stati Uniti e in Francia, con appassionati che restituiscono il colore facendo ricerche sul periodo, le uniformi ecc., con appassionati che fanno ad esempio ricerche specifiche sulle uniformi in una restituzione iconografica non dissimile alle cartoline che abbiamo visto, immagini poi diffuse sui social (anche a pagamento) o con pubblicazioni generaliste (Manduit 2019; Jones, Amaral 2019). Ancora più recentemente sono colorate con la stessa tecnica immagini di personaggio famosi, come attori, politici, sportivi.

Questo quadro offre spunti di riflessione sulla dualità tra immagini in bianco e nero e a colori. In senso generale, anche nelle pubblicazioni citate, il colore è un'appendice, non lo si usa per aumentare il livello descrittivo dell'evento: in *La Couleur du temps*, ad esempio, si mostrano colorate alcune foto dell'*affaire Dreyfus*, con una narrazione del tutto slegata alle immagini, che mostrano Alfred Dreyfus in tribunale e un ritratto di Émile Zola che lo difese nel noto «*J'accuse*» su *Le Figaro* (1897) (Jones, Amaral 2019, 66-7). In questo caso Zola in bianco e nero e Zola a colori non spostano la questione Dreyfus, non ci danno cioè informazioni aggiuntive, nella misura in cui poi esistono già immagini colorate, pur non fotografie, di Dreyfus e del processo. Una nuova immagine di Alfred Dreyfus, colorata, nell'aula del tribunale, poco ci aiuta a dipanare la vicenda: ciò che nella foto originale è in bianco e nero è comunque noto, come i colori degli abiti e gli arredi del tribunale. È noto perché la colorazione manuale è condotta come accennato facendo ricerche sui colori originali e non automatizzando il processo, per cui in qualche modo il risultato è atteso più che supposto. La colorazione non è una sfida tra un operatore manuale e un computer.

Ciò che emerge da queste foto - dalle nuove tendenze di colorazione dei personaggi più che degli aventi bellici - è il *pathos*, lo stupore di fronte a una Storia in *apparenza* rinnovata dal colore, come se nel caso citato l'intero processo Dreyfus si fosse svolto in bianco e nero. Il fraintendimento iconografico del passato dato dall'attualizzazione delle immagini espone a un pericolo tuttavia più teorico che pratico. Il nodo interpretativo è che il grande pubblico potrebbe confondere il reale (in bianco e nero) con il ricostruito (a colori), nella misura in cui «qualunque oggetto è stato prodotto con la tecnologia che esisteva al suo tempo: le foto sono monocrome per buona parte dell'Ottocento, i film lo sono fino agli anni Trenta e quella è la loro natura» (cit. Cavanna in Signorelli 2020). Anche l'elaborazione dei filmati, e delle immagini, è in fin dei conti il frutto di un'idea del passato elaborato da un algoritmo di intelligenza artificiale basandosi sui dati forniti in fase di addestramento, fra l'altro provenienti da immagini contemporanee, così come le immagini inserite per migliorare la fluidità del video sono aggiunte da zero, anziché essere recuperate dalla pellicola. Questi ultimi aspetti sono pregnanti per una critica

alla colorazione automatica delle immagini, e li vedremo nel dettaglio. Tuttavia, l'ipotesi che colorare immagini in bianco e nero non ci porta più vicini al passato, bensì ad aumentare la distanza tra allora e oggi creando differenza anziché immediatezza, può essere intesa come una forzatura, nella misura in cui in ambito storico-antropologico la colorazione va nella direzione di un aumento della quantità delle informazioni disponibili, si pone cioè, in senso generale, come la traduzione scientifica di un testo antico, magari un manoscritto egizio, che nessuno riterrebbe scritto in originale nell'italiano o inglese del 2021. Va tuttavia osservato come sempre di più appaiano in rete, non solo sui social più generalisti ma anche a corredo di articoli e saggi, immagini ricolorate senza nessuna indicazione specifica sia del loro essere state colorate sia delle tecniche utilizzate, dando oramai per acquisito il procedimento e ciò può produrre nel pubblico non specializzato false ipotesi.¹¹

3 Digitale

2.1 Algoritmi

Prima di approfondire con esempi più puntuali alcuni aspetti della colorazione automatica si presenta in sintesi un riassunto schematico degli algoritmi utilizzati nel lavoro, indicandone la letteratura collegata e i siti sui quali è possibile fare sperimentazione, posti nell'ordine in cui sono stati resi disponibili in rete (dati aggiornanti al settembre 2021). Se in gran parte il loro sistema di funzionamento è simile, pur se non per tutti è disponibile una letteratura analitica, con prima il riconoscimento delle aree da colorare e poi la loro elaborazione cromatica, vista anche in un'identificazione generale della scena, il valore di verosimiglianza del risultato finale è legato ai modelli di addestramento, che possono essere condotti su immagini generaliste o su ambiti specialistici.

Gli algoritmi Zhang e Iizuka sono quelli con una letteratura più ampia e meglio circostanzianti nel funzionamento, anche se si tratta di ricerche già datate e con processi di apprendimento generalizzati. Image e Antic sono frutto di sperimentazioni individuali che sfruttano codici *open source* senza indicazioni specifiche, con un addestramento anche qui molto ampio. DeOldify è l'algoritmo più interessante: sviluppato da ricercatori indipendenti dal 2018, è addestrato soprattutto sulla figura umana in contesti familiari, con risultati significativi.

¹¹ Si tratta di una citazione di Luke McKernan, curatore della British Library, da una sua nota sul suo blog del gennaio 2018 dal titolo «Colouring the Past», <https://lukemckernan.com/2018/01/25/colouring-the-past/>.

I processi precedentemente citati con addestramento ampio e generale tendono a restituire valori corretti soprattutto in contesti naturali, penalizzando le persone e l’abbigliamento. DeOldify, implementato dal 2020 su un sito di ricerche genealogiche (con algoritmi non più *open source* e letteratura disponibile), va sempre migliorando i risultati di colorazione, sia per aspetti culturali, abiti, arredamento ecc., sia con un riconoscimento puntuale delle caratteristiche somatiche e la successiva colorazione, anche se ovviamente non tutti i risultati appaiono ottimali.

Algoritmo	Letteratura	Sito
Zhang	Zhang, R.; Isola, P.; Efros, A.A. (2016). «Colorful Image Colorization». Leibe, B.; Matas, J.; Sebe, N.; Welling, M. (eds), <i>Computer Vision – ECCV 2016. ECCV 2016. Lecture Notes in Computer Science</i> , no. 9907. https://arxiv.org/abs/1603.08511	https://demos.algorithmia.com/colorize-photos
iizuka	iizuka, S.; Simo-Serra, E.; Ishikawa, H. (2016). «Let there be Color! Joint End-to-end Learning of Global and Local Image Priors for Automatic Image Colorization with Simultaneous Classification». <i>ACM Transactions on Graphics (SIGGRAPH)</i> , 35(4). http://hi.cs.waseda.ac.jp/~iizuka/projects/colorization/en/	http://iizuka.cs.tsukuba.ac.jp/projects/colorization/web/
Image	Dati generali: https://imagecolorizer.com/	https://imagecolorizer.com/colorize.html
Antic	Autore Jason Antic, API e dati sommari sul procedimento: https://deepai.org/machine-learning-model/colorizer	https://deepai.org/machine-learning-model/colorizer
DeOldify	Sito di riferimento: https://deoldify.ai/ . Codici della prima versione: https://github.com/jantic/DeOldify	https://www.myheritage.it/incolor

2.2 Letteratura

La letteratura sull’elaborazione del colore nelle immagini, pur sempre più numerosa, è ancora ristretta ad ambiti specialistici, con una marcata discussione delle metodologie più che dei risultati. Un lavoro divulgativo con un significativo taglio scientifico sull’*artificial intelligence*, uscito di recente (Quintarelli 2020), non affronta il tema dell’elaborazione delle immagini, sia nella fase di acquisizione sia nella postproduzione automatizzata.¹² L’ottenimento delle immagini non è un aspetto secondario: gran parte delle case di produzione di telefoni cellulari implementa nelle fotocamere sistemi di ‘scatto’ controllati da intelligenza artificiale. Il riferimento a questo strumento non è casuale: nel 2020 circa il 90% di tutte le foto è stato fatto con

¹² Un quadro storico di riferimenti, anche se non ci sono dati analitici all’elaborazione delle immagini, è offerto da Jacobelli 1987.

cellulari (circa 1,43 trilioni).¹³ Questi sistemi sono basati su modelli di *machine learning* e se pur i produttori siano avari di particolari si trovano disponibili alcuni paper che ne tratteggiano le linee principali, non marginali allo sviluppo poi di algoritmi dedicati alla colorazione automatica. Se le tecniche automatiche di ripresa si indirizzano ad esempio a una miglior gestione della luminosità, e non necessariamente in condizioni estreme (Runsheng et al. 2018)¹⁴ con parametri ottimizzati dal sistema, allo stesso tempo anche la gestione del colore, la sua interpretazione in un mix tra visione umana e maggior resa reale (e le due cose non sono in conflitto) si indirizza su modelli automatici, sempre sfruttando il *machine learning*. Quest'ultimo aspetto è significativo in merito ai risultati: i modelli di addestramento si fanno sempre più ampi e diffusi per cui la direzione è quella che può essere definita visione naturale: più informazioni e strumenti di confronto sono disponibili migliore sarà il risultato finale.¹⁵

I sistemi di colorazione automatica lavorano adesso in gran parte con le *convolutional neural network* (CNN), reti neurali artificiali che simulano i modelli di visione biologici, nelle quali i risultati possono essere rinforzati e migliorati nel tempo con modelli di apprendimento legati a forme di ricompense e anche con sistemi di *adversarial machine learning*.¹⁶ Nonostante le prime ricerche teoriche in questo campo risalgano agli anni Quaranta del Novecento, la loro applicazione pratica è recente con risultati significativi nel campo del riconoscimento facciale e del linguaggio - e con una vasta e analitica letteratura.¹⁷ Un contributo del 2016, pur obsoleto, rimane utile, perché focalizza i limiti e gli errori che gli algoritmi di colorazione possono incontrare. Il lavoro evidenzia come un addestramento massiccio - qui è stato condotto su 1,2 milioni di immagini (un quantitativo medio per questo genere di approcci) - non sempre è in grado di dare risultati accettabili. Viene citata come esempio limite un'immagine di Anne Frank del 1939 dove si vede la ragazza seduta su una sedia a sdraio all'aperto con alle spalle un cuscino. Se l'immagine è

¹³ <https://www.lucacazzaniga.it/fotografia-cellulare/quante-foto-sono-state-scattate-negli-ultimi-anni/>.

¹⁴ I ricercatori operano nei Xiaomi AI Lab in Cina.

¹⁵ Sugli aspetti della visione, sia in senso fisiologico sia negli approcci dell'*artificial intelligence*, un quadro aggiornato è in Masland 2021.

¹⁶ La letteratura su questi temi è sempre più ampia ed è impossibile indicare una bibliografia di riferimento esaustiva. Un quadro generale aggiornato si trova in Joseph et al. 2019.

¹⁷ Sul riconoscimento facciale una bibliografia storica (sino alla fine degli anni Novanta) è riportata in <https://www.ini.rub.de/PEOPLE/wiskott/Bibliographies/FaceRecognition.html>; dati più recenti in <https://pythonhosted.org/facereclib/references.html>. Sul linguaggio e l'*artificial intelligence* una bibliografia storica è disponibile qui: <https://liinwww.ira.uka.de/bibliography/Ai/speech.recognition.html>.

nel complesso resa cromaticamente in modo abbastanza sensato il cuscino non è interpretato in modo corretto: a prescindere dalla forma c'è una variabilità di colori che un intervento manuale potrebbe interpretare ma che un sistema neurale ha difficoltà a definire.

Il modello non è in grado di colorare i cuscini perché i cuscini potrebbero essere di qualsiasi colore. Anche se il set di allenamento è pieno di cuscini (cosa che non credo lo sia), saranno tutti di colori diversi e il modello probabilmente finirà per calcolarne la media in un tono seppia. Un essere umano comunque può scegliere un colore casuale e anche se si sbaglia avrà un aspetto migliore di nessun colore.¹⁸

La soluzione a questo problema, che non è marginale in una corretta interpretazione di *tutta* l'immagine di Anne Frank, non è immediata neppure con un forte addestramento dell'algoritmo, data la quasi infinita variabilità di un oggetto banale come un cuscino e l'impossibilità, una volta riconosciuto, di contestualizzarlo nel modo corretto. Arrivando tuttavia a una ragionevole colorazione solo di alcune parti - escludendo il cuscino e valorizzando la figura di Anne - il procedimento non è fallimentare, perché ci offre in ogni caso informazioni utili, legate ad esempio a una più puntuale collocazione cronologica: Anne ha un vestito a maniche corte, una corretta restituzione del colore del prato alle sue spalle ci può meglio indirizzare verso la stagione più significativa, ad esempio la primavera rispetto a una estate inoltrata.

Se la colorazione automatica delle immagini è una sfida *in progress*, allo stesso tempo va valutato il valore di approssimazione al risultato. Oggi, rispetto a cinque anni fa, i programmi per il riconoscimento automatico del testo scritto (OCR/HTR) danno senza dubbio risultati migliori, anzi, il riconoscimento automatico dei manoscritti dà già risultati significativi,¹⁹ tuttavia i programmi OCR/HTR ancora introducono errori nella risposta, sempre meno gravi, ma presenti: un sistema OCR/HTR molto diffuso, di una casa leader, ha evidenti difficoltà di riconoscimento delle parti in corsivo in libri stampati nell'Ottocento, aspetto marginale ma allo stesso tempo evidente e al momento certamente non di facile soluzione dato che l'errore permane da anni.

¹⁸ «The model is unable to color cushions because cushions could be any color. Even if the training set is full of cushions (which I don't think it is), they will all be different colors and the model will probably end up averaging them to a sepia tone. A human can choose a random color and even if they're wrong, it will look better than no color» <https://tinyclouds.org/colorize/>.

¹⁹ Si veda ad esempio il progetto *Transkribus*, finanziato dalla Comunità Europea, e limitato al momento ad alcune lingue (<https://readcoop.eu/transkribus/>).

L'ipotesi di un *range* di ragionevolezza nella colorazione si pone qui in un quadro generale di approssimazione al risultato, che tuttavia può anche essere non pienamente valutabile e con la necessità di fidarsi dell'algoritmo. La fiducia nel risultato è un tema già espresso nei paper di corredo alle sperimentazioni, con valutazione assai ottimistiche non sempre però condivisibili. Un lavoro circostanziato pubblicato nel 2016 evidenzia un passaggio metodologico che lascia interdetti:

Valutare le immagini sintetizzate è notoriamente difficile. Poiché il nostro obiettivo finale è quello di produrre risultati convincenti per un osservatore umano, introduciamo un nuovo modo di valutare i risultati della colorazione, testando direttamente il loro realismo percettivo. Abbiamo impostato un 'test di Turing di colorazione', in cui mostriamo ai partecipanti colori reali e sintetizzati per un'immagine e chiediamo loro di identificare il falso. In questo paradigma abbastanza difficile, siamo in grado di ingannare i partecipanti sul 32% delle istanze (le colorazioni della verità del terreno raggiungerebbero il 50% su questa metrica), significativamente più alte rispetto al lavoro precedente. Questo test dimostra che, in molti casi, il nostro algoritmo sta producendo risultati quasi fotorealistici. (Zhang 2016)²⁰

Senza approfondire significato e valore del Test di Turing (che misura in via del tutto teorica la capacità di un computer di mostrare intelligenza) sul quale c'è adeguata letteratura²¹ a partire dal saggio originale (Turing 1950), è più utile sottolineare che i risultati ragionevoli di questo algoritmo sul campo sono inferiori ad altri dello stesso periodo. L'enunciazione del 32% sul Test non ha un reale valore che dimostri la maturità del sistema, dato inoltre che, se noto, può inficiare la fiducia nel risultato. I «photorealistic results» sono poi ancora teorici, nella misura in cui è impossibile valutare in modo strumentale, e quindi oggettivo, la foto perfetta, definizione soggetta a troppe variabili. In una chiave più generale, è possibile considerare come i modelli teorici e pratici legati ai programmi di colorazione automatica tendano a passare in secondo piano: se si hanno ancora algoritmi

²⁰ «Evaluating synthesized images is notoriously difficult. Since our ultimate goal is to make results that are compelling to a human observer, we introduce a novel way of evaluating colorization results, directly testing their perceptual realism. We set up a 'colorization Turing test', in which we show participants real and synthesized colors for an image, and ask them to identify the fake. In this quite difficult paradigm, we are able to fool participants on 32% of the instances (ground truth colorizations would achieve 50% on this metric), significantly higher than prior work. This test demonstrates that in many cases, our algorithm is producing nearly photorealistic results».

²¹ Un elenco molto ampio e aggiornato si trova in <https://philpapers.org/browse/the-turing-test>.

open source sui quali condurre ricerche e miglioramenti, allo stesso tempo la diffusione di programmi o a pagamento o con scarsa letteratura (una mancanza ben più grave) evidenzia da una parte un interesse per il solo risultato, la ‘bella foto colorata’, dall’altro proprio l’idea di una fiducia in quel risultato, quando si hanno parametri per una valutazione oggettiva del risultato: una bella foto colorata può anche essere del tutto errata rispetto alla realtà.

Un recente progetto di ricerca (Luo et al. 2020) propone per la colorazione di immagini di personaggi storici un approccio differente da quelli visti sino ad ora. Utilizzando il sistema di generazione di immagini virtuali StyleGAN2²² con reti neurali in competizione per ottenere il miglior risultato partendo da set di dati uguali («generative adversarial networks»),²³ il progetto *Time-Travel Rephotography*²⁴

rifotografa soggetti famosi simulando un viaggio indietro nel tempo con una fotocamera moderna: a differenza dei filtri di ripristino delle immagini convenzionali che applicano operazioni indipendenti come la denoising, la colorazione e la super-risoluzione, sfruttiamo il framework StyleGAN2 per proiettare vecchie foto nello spazio delle moderne foto ad alta risoluzione, ottenendo tutti questi effetti in un quadro unificato. Una sfida unica di questo approccio è catturare l’identità e la posa del soggetto della foto e non i molti artefatti in foto antiche di bassa qualità. (Luo et al. 2020, 4321)²⁵

L’immagine originale, qualunque siano le condizioni, legate non solo alla qualità della ripresa ma anche alla sua conservazione, viene riprogettata e non solo restaurata: il processo tiene conto di aspetti non percettibili, come il range tecnico entro il quale la ripresa fotografia in bianco e nero si collocava. Gli aspetti tecnici dell’immagine sono approfonditi nei passaggi iniziali del lavoro, con l’esame di una foto di Abraham Lincoln scattata l’8 novembre 1863.

La pellicola dell’era di Lincoln era sensibile solo alla luce blu e UV, facendo apparire le guance scure e enfatizzando eccessivamente le rughe filtrando la dispersione dell’apparenza cutanea che si

²² <https://github.com/NVlabs/stylegan2>.

²³ Un quadro analitico è in Goodfellow et al. 2014.

²⁴ <https://time-travel-rephotography.github.io/>.

²⁵ «simulates traveling back in time with a modern camera to rephotograph famous subjects. Unlike conventional image restoration filters which apply independent operations like denoising, colorization, and superresolution, we leverage the StyleGAN2 framework to project old photos into the space of modern high-resolution photos, achieving all of these effects in a unified framework. A unique challenge with this approach is capturing the identity and pose of the photo’s subject and not the many artifacts in low-quality antique photos».

verifica principalmente nel canale rosso. Quindi, le linee profonde e le pieghe taglienti che associamo al volto di Lincoln sono probabilmente esagerate dal processo fotografico dell'epoca. (Luo et al. 2020, 4321)²⁶

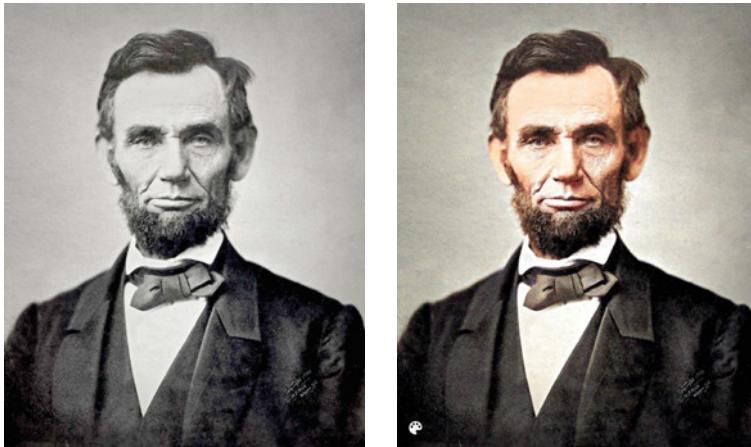


Figura 3 Da sinistra, Abraham Lincoln, 8 novembre 1863, autore non identificato. Colorazione DeOldify, miglioramento preventivo e colorazione DeOldify. Elaborazioni dell'Autore

Colorando la foto di Lincoln con DeOldify e utilizzando la miglior immagine disponibile in rete, si ottiene un risultato di scarsa qualità, anche inserendo nelle fasi preliminari alcuni miglioramenti (automatici) [fig. 3]. I risultati di *Time-Travel Rephotography* appaiono invece certamente più convincenti, anche limitandosi solo a questa immagine per la quale abbiamo fatto confronti più specifici, pur prestando il fianco, dato l'utilizzo di StyleGAN2, ad alcune critiche. In merito a questo strumento, sviluppato dai tecnici Nvidia e rilasciato *open source*, Phillip Wang (*Uber*) ha realizzato il sito *This Person Does Not Exist*,²⁷ nel quale si generano a ogni *refresh* della pagina volti umani casuali di un drammatico realismo, indistinguibili da quelli di persone reali [fig. 4]. In linea con queste considerazioni il progetto *Which Face is Real*,²⁸ sviluppato da Jevin West e Carl Bergstrom della University of Washington, sfida gli utenti a riconoscere in una coppia di immagini di volti, uno reale e uno generato con StyleGAN2.

26 «The film of Lincoln's era was sensitive only to blue and UV light, causing cheeks to appear dark, and overly emphasizing wrinkles by filtering out skin subsurface scatter which occurs mostly in the red channel. Hence, the deep lines and sharp creases that we associate with Lincoln's face are likely exaggerated by the photographic process of the time».

27 <https://thispersondoesnotexist.com/>.

28 <https://www.whichfaceisreal.com/>.



Figura 4 Volti casuali generati dal sito <https://thispersondoesnotexist.com>

Il paper di *Time-Travel Rephotography* è stato reso pubblico alla fine del 2020 e sino a ora non ha sviluppato un significativo dibattito in ambito specialistico: vi sono solo cenni, con la riproduzione delle immagini elaborate, soprattutto su forum di *computer graphics* con commenti che mettono in evidenza il lato estetico dei risultati. In realtà, visto che il cuore del progetto è un sistema dedicato alla creazione di immagini fotorealistiche, si potrebbe discutere su cosa sia il vero risultato finale, su quanto cioè StyleGAN2 introduca di virtuale nell'immagine finale, che potrebbe apparire come un artefatto *steampunk* (anche animabile e restituibile in 3D senza difficoltà). È evidente come non sia necessario invocare un'etica della colorazione automatica ma, estremizzando, il Lincoln di *Time-Travel Rephotography* non è dissimile dai dinosauri della saga *Jurassic Park*, ovvero un'elaborazione 2D che potrebbe anche essere integralmente generata da un computer assemblando le migliori immagini di Lincoln e colorandole secondo i canoni attuali. *Rephotography* infine è un termine con un significato preciso:

Il nostro obiettivo è simulare viaggi indietro nel tempo e fotografare di nuovo personaggi storici con una fotocamera moderna. Chiamiamo questa 'rifotografia del viaggio nel tempo', adattando il termine rifotografia che tradizionalmente significa 'l'atto di ripetere la fotografia dello stesso sito, con un intervallo di tempo tra le due immagini'. (Luo et al. 2020, 4322-3)²⁹

Lo spazio temporale tra la foto originale e quella trasformata è colmato dall'elaborazione digitale con un risultato, tuttavia, che punta molto all'estetica: l'immagine originale di Lincoln è senza dubbio iconica, fortemente simbolica, scattata durante il suo mandato presidenziale, e in questo caso la colorazione appare come una forzatura, come un restauro eccessivo: in effetti più che una fotografia ricoloreata appare come un dipinto, un ritratto iperrealista o una caratterizzazione cinematografica [fig. 5].



Figura 5 Abraham Lincoln e altre personalità elaborati e colorati. Immagine tratta da Luo et al. 2020, 4321

Significativo, infine, come il progetto si indirizzi esclusivamente alla figura umana. La linea che viene percorsa appare tendere a una visione *deepfake* della realtà, dove si sviluppa un mondo parallelo, insinuato tra foto in bianco e nero e a colori, non semplicemente all'atto del colorare, che è sì un'attualizzazione del *ricordo* - la versione

²⁹ «Our goal is to simulate traveling back in time and rephotographing historical figures with a modern camera. We call this '*time-travel rephotography*', adapting the term rephotography which traditionally means 'the act of repeat photography of the same site, with a time lag between the two images».

commerciale di DeOldify va assolutamente in questa direzione - ma in questo caso, anche con sviluppi possibili, la sua trasformazione, la costruzione, anche, di una storia 3D, anzi, la sua ricostruzione. I volti di This Person Does Not Exist oscillano - a prescindere dalla conoscenza del progetto - tra il perturbante e un'indifferenza di *déjà vu*: i personaggi storici colorati con *Time-Travel Rephotography* (che al momento appare tuttavia come lo stato dell'arte) si insinuano più nelle pieghe della Storia, quando le colorazioni meno definite, anche per i difetti dell'immagine originale, ci ponevano un po' a distanza dal risultato.

2.3 Colori

Le considerazioni che seguono sono frutto di sperimentazioni condotte dal 2017 utilizzando algoritmi differenti, nella gamma di quelli in precedenza indicati e sottoponendoli a *stress test* con immagini native di varia provenienza, sia analogiche sia digitali (anche con vari gradi di risoluzione) al fine di valutare la *ragionevolezza* nella restituzione del colore.³⁰ Il termine 'ragionevole' potrebbe apparire troppo empirico e incapace di dare nella valutazione dei risultati una corretta risposta. Il nodo sta invece nell'impossibilità di una misurazione oggettiva e strumentale dei risultati, per cui è necessario introdurre una stima se non proprio soggettiva legata almeno a un campo probabilistico, nel quale la ragionevolezza è un parametro valido. Possiamo considerare come in una fotografia a colori un cielo verde abbia un basso grado di ragionevolezza, così come il mare viola, ma questi colori sono noti a tutti, per cui è necessario rendere la valutazione ragionevole per gradi, approssimando l'immagine nel suo complesso e non per singole aree, anche se come accennato un punto correttamente colorato in una visione generale errata può essere utile.

Abbiamo visto con le cartoline due esempi: in uno la colorazione automatica ha dato un risultato fallace, diciamo con una ragionevolezza < a 50, nell'altro valido nel complesso, con una ragionevolezza > di 50. In effetti questo discriminante, < o > a 50 (al 50% dell'immagine) è un parametro empirico che ci può dare delle risposte, pur nella misura in cui la valutazione dell'allontanamento o avvicinamento al valore medio è data dalla precisione soggettiva dall'occhio umano. Il motivo per il quale è impossibile una valutazione strumentale del risultato è chiarito in modo evidente dalle immagini che seguono, che ci danno anche significative informazioni su come gli algoritmi di colorazione lavorino [**fig. 6**]:

³⁰ Queste acquisite sia a colori e poi trasformate in scala di grigi, sia acquisite già in scala di grigi, con più dispositivi.



Figura 6 Da sinistra, scala di colori nella loro disposizione 'naturale'; la scala a colori è stata trasformata in scala di grigi; scala in grigi 'colorata' con Image; scala in grigi 'colorata' con Antic. Elaborazioni dell'Autore

Il risultato non deve sorprendere: gli algoritmi non sono stati in grado di colorare la scala perché questa immagine manca di un qualunque *pattern* di riferimento che permetta l'esatta attribuzione del colore. Si tratta nell'immagine in scala di grigi appunto di grigi che nella realtà di una possibile fotografia debbano rimanere così, come una facciata di una casa o di un'area marcatamente in ombra. Il citato cuscino di Anna Frank possedeva un *pattern* pur se molto generico oltre a una modesta contestualizzazione, per cui anche se inventato un colore gli è stato attribuito. La misurazione strumentale, ad esempio con un colorimetro digitale (e adesso ne abbiamo di molto raffinati in grado di restituire un'immediata risposta Panton), del risultato puro è impossibile, pur se questo aspetto potrebbe essere significativo nelle fasi di apprendimento dell'algoritmo. Ancora, l'addestramento con l'elaborazione di un numero sempre più ampio di immagini *attuali*, non è secondario, perché potrebbe falsare il risultato.

Un rischio non necessariamente legato a *Neural Love* (che spesso, ma non sempre, nei suoi video ricostruisce il lavoro svolto fornendo quindi le informazioni di contesto), ma alla diffusione online di

siti e programmi che permettono a chiunque di svolgere operazioni simili con qualunque foto, sempre utilizzando software di intelligenza artificiale e che - a causa dell'addestramento con dati contemporanei - finiscono a volte a far indossare blue jeans a uomini dell'800. (Signorelli 2020)³¹

Questa critica è corretta nella misura in cui l'addestramento sia condotto senza un adeguato approfondimento, considerando che sì, le fotografie a colori degli abiti dell'Ottocento sono rare o assenti, ma non sono rare le fonti grafiche di tali colori che allo stesso tempo possono essere correttamente parametrizzate. Accenno che *Time-Travel Rephotography* utilizza per l'elaborazione un'immagine parallela già a colori generata appositamente, definita come 'sibling' (fratello), con le caratteristiche facciali più simili possibili all'originale e dalla quale estrarre in parte le caratteristiche cromatiche da applicare sul bianco e nero, in un sistema di preaddestramento che fa avanzare la successiva elaborazione completa del colore, per ridurre infine il peso dell'immagine parallela nel risultato finale. Questo passaggio porta a minimizzare il rischio di un passaggio retroattivo che porterebbe il *fratello* a sovrapporsi all'originale. Questi modelli di lavoro alleggeriscono in parte la necessità di un pesante addestramento con set di immagini massivi, ma è evidente come il risultato sia sempre al limite tra un reale ragionevole e il virtuale di StyleGAN2.

2.4 Moda

Prove condotte su immagini in bianco e nero di abiti di alta sartoria italiana degli anni Sessanta hanno dato risultati di colorazione, a detta di storici e tecnici della moda,³² poco incoraggianti. La moda d'autore è un atto creativo, dove le regole di costruzione del colore non sono uniformi: se un insieme di alberi con foglie rimanda all'estate per cui la colorazione è ragionevolmente verde intenso e un albero spoglio rimanda all'inverno con colori consequenti, un abito dei primi anni Sessanta probabilmente di Roberto Capucci non è facilmente inquadrabile in norme precise, per cui il risultato è incerto, partendo da una foto originale in bianco e nero [fig. 7].³³

³¹ <https://neural.love/>.

³² Ringrazio qui Anna Bartolini e Aurora Fiorentini per la collaborazione. Grazie anche al fotografo Filippo Basetti.

³³ Foto dalla cartella stampa di *Moda italiana a Vienna*, 25-26 maggio 1964, s.l., s.e.



Figura 7 Foto originale in bianco e nero, Vienna 1964. Colorazione Antic.
Proprietà ed elaborazione dell'Autore

La ricchezza cromatica dell'abito in passerella viene appiattita dalla colorazione - pur se il contesto assume un cromatismo a prima vista ragionevole, come nella cartolina del Portico dei Servi di Bologna. Se l'unica documentazione di questo abito fosse la foto in bianco e nero non sarebbe facile per gli storici della moda proporre interpretazioni sui colori originali. Anche mettendo in evidenza l'abito non si hanno risultati utili [fig. 8]. L'ultima immagine è colorata con l'algoritmo DeOldify che abbiamo visto nel dettaglio: secondo Anna Bartolini, progettista dell'abbigliamento sin dagli anni Settanta, il risultato è ancora peggiore di quello di Antic, perché l'abito risulta appiattito su un tono bianco forse non usato da Capucci. Le fotografie documentano per la stampa una sfilata di moda italiana, della scuola fiorentina, a Vienna nel 1964: si tratta di immagini professionali stampate su carta fotografica, acquisite poi ad alta risoluzione, per cui l'algoritmo non risente di una qualità scadente (anche se altre prove evidenziano come la qualità dell'immagine non sia un parametro essenziale) e l'interpretazione appare confusa.

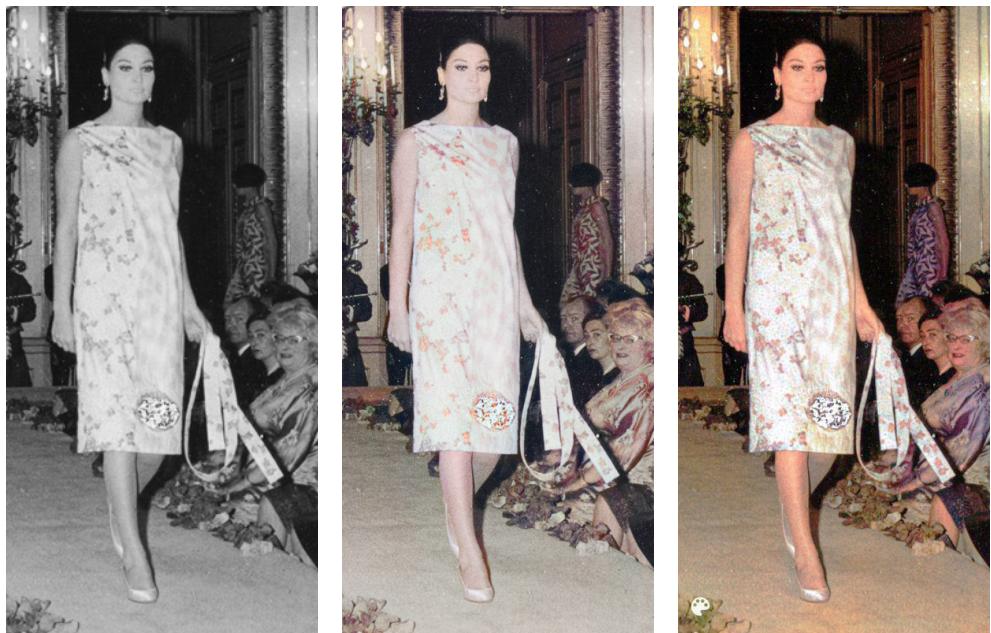


Figura 8 Da sinistra, foto originale in bianco e nero, Vienna 1964, particolare. Colorazione Antic; colorazione DeOldify. Proprietà ed elaborazioni dell'Autore

Come accennato *Time-Travel Rephotography* considera nell'elaborazione il tipo di pellicola utilizzata nella ripresa, ragionevolmente per range ampi. Per gli algoritmi utilizzati per le prove non si accenna nella letteratura disponibile a questo aspetto, per cui è corretto affermare che questo parametro non sia preso in considerazione. Senza spingersi ai vari tipi di immagini sviluppati nell'Ottocento e in parte citati, anche un solo riferimento agli anni Cinquanta-Sessanta del Novecento mostra una significativa variabilità. Un dettagliato manuale inglese (è un esempio dei tanti) della fine degli anni Cinquanta, tradotto in italiano nel 1961 (De Maré 1961) tratteggia in più di un capitolo le varie tipologie di lastre e pellicole, sia per la fotografia in bianco e nero sia per quella a colori, facendo considerazioni sullo sviluppo e sulla stampa.

Una differenza non secondaria, e gli anni Cinquanta ne sono un discriminante, è tra pellicola in bianco e nero ortocromatica e pellicola a colori pancromatica: la prima - e le lastre così definibili - è sensibile solo alle lunghezze d'onda del blu e verde, mentre la seconda è sensibile a tutto lo spettro cromatico. Le modalità di sviluppo e fissaggio sono differenti per i due tipi di pellicola, nella composizione chimica, nella temperatura e nel procedimento pratico: la pellicola ortocromatica non essendo sensibile al rosso può essere sviluppata a

vista illuminando il laboratorio con una luce rossa. Ci sono delle regole precise da seguire se si vuole ottenere un risultato. Errori sulle percentuali dei componenti chimici (con riferimento a sistemi amatoriali), nella temperatura, nei tempi dei bagni portano anche alla totale scomparsa, irrecuperabile, dell'immagine. Allo stesso modo voler sviluppare una pellicola pancromatiche come una ortocromatiche e viceversa non porta a nessun risultato valido.

Possiamo ipotizzare per immagini complesse come quelle viste per la moda che l'algoritmo non tenga conto della sensibilità spettrale del supporto - non importa se su negativo o stampa su carta data la possibilità di lavorare con entrambi i tipi nell'acquisizione dell'immagine in digitale (e ovviamente anche con lastre di vetro) - e possa produrre nella colorazione errori paragonabili a quelli di un errato sviluppo. Si introducono cioè disturbi che virano l'immagine sulla base della non sensibilità a determinati spettri, come appunto il rosso, considerando inoltre il tipo di illuminazione, se naturale o artificiale (aspetto rilevante per le foto di moda) e infine la marca della pellicola che potrebbe dare ulteriori differenze. In effetti, empiricamente, ci sono immagini in bianco e nero che con qualunque algoritmo arrivano a risultati validi, altre che per contro è impossibile colorare e non solo per i motivi che abbiamo visto con le cartoline di Bologna. Per le foto di moda, generalizzando, si può inoltre considerare come la colorazione automatica porti a una *normalizzazione* dei colori, a una trasformazione probabilistica dell'immagine che non tiene conto degli aspetti creativi. Prove condotte con immagini più recenti a colori, trasformate in scala di grigi e poi ricolorate - protette da copyright, che quindi non possono essere mostrate - danno una ricolorezione non creativa, quando nell'originale erano inserite sfumature e colori del tutto unici: molto rilevante è una copertina di *Vogue USA* (October 2019, edizione digitale) che in origine ha un'uniforme sfumatura di verde tra sfondo e abito della modella e che Image restituisce in una ricca gamma di toni, non riconducibile alla realtà che vorrebbe essere mostrata.³⁴

L'immagine seguente, sempre relativa alla sfilata di Vienna del 1964, elaborata con DeOldify, risulta nel complesso migliore delle precedenti, con toni più ragionevoli nel contesto generale dell'immagine anche se l'eccesso di rosso potrebbe essere dato appunto dai limiti che abbiamo visto [fig. 9].

³⁴ Descrizione della foto di copertina: «Cover Look. The Merry Monarch. Olivia Colman wears a Dolce & Gabbana cape and pants. Bulgari ring. Hermès boots. To get this look, try: Double Wear Stay-in-Place Make-up in Tawny, Bronze Goddess Illuminating Powder Gelée, Pure Color Envy Lipstick in Nude Scene, The Brow Multi-Tasker in Dark Brunette, Little Black Liner in Black, Pure Color Envy Lash Multi Effects Mascara in Black. All by Estée Lauder. Hair, Sally Hershberger; make-up, Francelle Daly. Details, see in This Issue. Photographed by Annie Leibovitz. Fashion Editor: Tonne Goodman».



Figura 9
Da sinistra, foto originale in bianco e nero, Vienna
1964; colorazione Antic; colorazione DeOldify.
Proprietà ed elaborazioni dell'Autore

2.5 Albania

Ulteriori ricerche sono state condotte su due corpus di fotografie di autori italiani anonimi scattate in Albania. Il primo è composto da 164 foto del 1928, a margine di una missione cartografica italiana, foto di alta qualità che documentano il viaggio in Albania, con molte immagini di persone e luoghi. Il secondo è dato da 87 foto di un ignoto militare italiano nel 1941. Ho in parte ricostruito il contesto di esse, di rilievo storico, che documentano anche i bombardamenti dell'aviazione inglese nel porto di Valona del 15 aprile 1941, con i relitti semi affondati dei piroscafi *Stampalia* e *Luciano* oltre alla visita di metà maggio di Vittorio Emanuele III. Le fotografie sono state acquisite per un progetto di ricerca sulla percezione dell'Albania da parte degli italiani tra Settecento e Novecento sviluppato nel 2016 con l'antropologo visuale Paolo Chiozzi - con il quale ho studiato e collaborato sino alla sua scomparsa nel 2018 - con l'idea di colorarne alcune per verificare se le informazioni storico-antropologiche emergessero in maniera più incisiva. Se nel campo della moda i risultati sono ancora incerti, indagini legate all'uso del territorio danno risultati più precisi: o meglio, danno immagini che possono poi essere interpretate in modo più puntuale. La geografia dell'Albania, ad esempio, può essere sufficientemente indagata con la colorazione (tutte dalla serie 1928, Iizuka), con una significativa restituzione della gamma tonale [fig. 10].



Figura 10

Da sinistra, pastori albanesi 1928; paesaggio albanese non identificato 1928; ragazza albanese 1928. Proprietà ed elaborazioni dell'Autore con Iizuka

Questi sono esempi generali, ma la definizione del territorio, tra terre di montagna incolte e pascoli, si delineava in modo evidente. Aspetti più specifici appaiono incerti, abbigliamento e architettura, in questa serie e sempre con Iizuka [fig. 11].



Figura 11

Da sinistra, moschea non identificata, Albania 1928; bambini da località imprecisa, Albania 1928. Proprietà ed elaborazioni dell'Autore con Iizuka

Un discorso simile può essere fatto per la serie del 1941 [fig. 12].

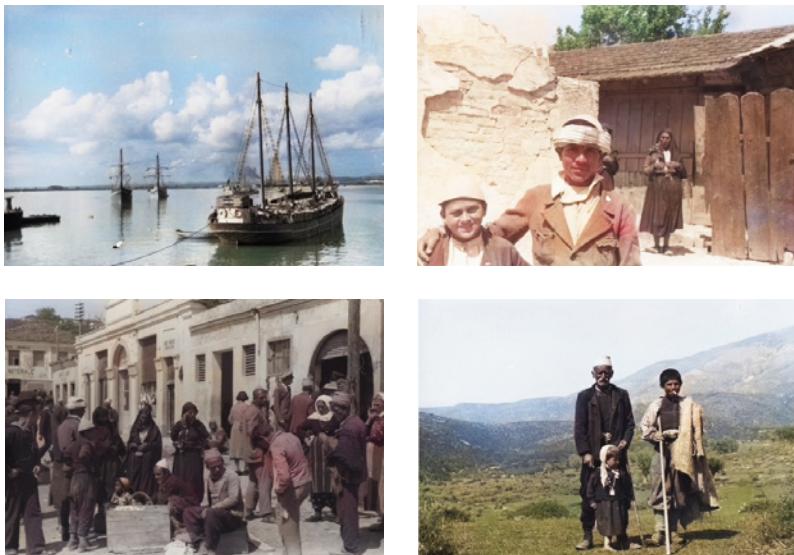


Figura 12 Da sinistra, navi nel porto di Valona 1941; persone in località imprecisata (Valona?), Albania 1941; persone (mercato?) in località imprecisata (Valona?), Albania 1941; pastori, Albania 1941.
Proprietà ed elaborazioni dell'autore con lizuka

In queste immagini il valore estetico dato dal colore è marginale: le foto sono abbastanza grezze e certamente, per gli aspetti che abbiamo già visto, la colorazione appare non ben definita. Tuttavia, già con questi parametri è possibile specie per il corpus del 1941 approfondire l'utilizzo del suolo e con esso sottolineare alcuni aspetti sociali. In particolare, nell'ultima immagine l'ipotesi che si tratti di pastori è suffragata da un uso attento del suolo: non vi sono aree brulle, senza erba, per cui è ragionevole, anche sulla base dell'abbigliamento che appare essere, specie per il ragazzo a destra, di lana grezza, che vi sia una pastorizia accorta, attenta alle stagioni e alle variazioni climatiche e di consumo dei prati. In queste due serie non tutte le fotografie hanno una resa ottimale nella colorazione: si potrebbe trattare di partite di pellicole differenti; quelle del 1928 poi sono state ragionevolmente sviluppate sul campo, per cui ci potrebbero anche essere disparità tra immagine e immagine, per una non uniformità del procedimento. Queste due foto dell'Albania (1941), elaborate con DeOldify, in un contesto di risultati ottimali e di un incremento di dati sono significative [fig. 13].



Figura 13 Da sinistra, Tirana, Albania 1941, immagini originali in bianco e nero.
Proprietà ed elaborazioni dell'Autore con DeOldify

Si tratta di due frammenti iconografici della italianizzazione e fascizzazione dell’Albania, che resi a colori permettono analisi più puntuali, come ad esempio sul rapporto tra abiti tradizionali e divise fasciste e la loro commistione nella foto dei ragazzi. La foto del balcone fa riferimento alla visita a Tirana di metà maggio 1941 di Vittorio Emanuele III - durante la quale, il 17 maggio, subisce un attentato da parte del patriota albanese Vasil Laçi, immediatamente fermato, condannato e impiccato il 27 maggio – anche qui con una commistione tradizionale (i tappeti) e littoria.

Si potrebbe considerare come gli aspetti brevemente citati potevano essere estrapolati dalle immagini originali in bianco e nero. Il confronto con le immagini colorate mostra la minor quantità di dati qui disponibile e il colore appare come un elemento essenziale di approfondimento. In merito ai tappeti al balcone abbiamo fatto alcune brevi verifiche. Una foto scattata a Tirana, pur senza una precisa indicazione cronologica, ragionevolmente dei primi anni Cinquanta – facente parte del Fondo Francesco e Franco Tagliarini, conservato nell’Archivio fotografico della Società Geografica Italiana³⁵ – mostra venditori di tappeti (l’immagine disponibile in rete ha una bassa risoluzione, tuttavia ne abbiamo provato la colorazione) [fig. 14].

³⁵ <http://www.archiviofotografico.societageografica.it/index.php?it/169/fondo-francesco-e-franco-tagliarini>.



Figura 14 Da sinistra, Tirana, vendita di tappeti. Colorazione Image; colorazione DeOldify.
Da: Edizioni Turismo Albanese, © Franco Tagliarini.
<https://www.albanianews.it/rubrica/chicheabitazione-tiranese-tradizioni-tirana>. Elaborazioni dell'Autore

Anche se le due colorazioni mostrano cromatismi differenti si comprende come colori e disegno non corrispondono a quelli dell'immagine 10. Sommarie ricerche su alcuni repertori (Campana 1966; Viale Ferrero 1969; Kendrik, Tattersall 1973) non hanno dato risultati: questo campo è strettamente specialistico; tuttavia, indagini per l'esatta definizione dei tappeti esposti a Tirana per la visita di Vittorio Emanuele III rappresentano un significativo aspetto per approfondire alcuni passaggi, anche simbolici, di quel momento, temi che solo con la colorazione possono emergere con chiarezza. Considerando infine come i colori della figura 13 possono non essere completamente rispondenti alla realtà, dati i limiti dello spettro del rosso, un approfondimento incrociato sui tappeti potrebbe permettere una più precisa calibrazione dei colori, individuando l'esatta tipologia dei tessuti.

4 Conclusioni

Per concludere si potrebbe riflettere su quanto funzioni adesso, nel 2021, la colorazione automatica delle immagini e in che direzione metodologica sia possibile andare. Alla seconda domanda ho in parte già risposto, e riassumo: gli algoritmi disponibili o sono generalisti, per cui danno risultati imprecisi, o vanno in una direzione di specializzazione che può colorare solo alcuni ambiti, come, ma in senso molto ampio, le immagini di persone. In questo quadro si inserisce il progetto *Time-Travel Rephotography*, che al momento tuttavia non ha prodotto significativi dibattiti e ulteriori progetti di ricerca. Valutando ambiti particolari - quali la storia del costume, l'archeolo-

gia³⁶ (Maltese 2020), l'antropologia culturale - per maggiori e nuove indagini sui materiali disponibili e il loro restauro, la strategia dovrebbe essere quella di sviluppare algoritmi ad hoc. In questi casi sono necessari addestramenti peculiari, per un puntuale riconoscimento e poi colorazione degli oggetti, con un'applicazione dell'*artificial intelligence* a discipline umanistiche.

Il progetto *ArchAide*, sviluppato dal Dipartimento Civiltà e Forme del Sapere dell'Università di Pisa, utilizzabile sia da sito web che come app, permette il riconoscimento immediato di una vasta gamma di materiali ceramici tramite *automatic image recognition* e *machine learning* molto raffinati, con la simulazione ad esempio di linee di frattura per le anfore romane.³⁷ Il lavoro del team di *ArchAide*, del quale ho seguito come osservatore alcuni momenti chiave nel 2018 e 2019, si colloca nella linea della colorazione automatica, con l'implementazione di strumenti atti a migliorare e ottimizzare l'analisi dei materiali, con la definizione di *open data* sempre più vasti e addestramenti specifici. In senso generale ci possiamo chiedere infine quanto bene funzionano adesso, a fine 2021, i sistemi di colorazione automatica, se abbiano una resa interpretativa > 50 e tendente a valori sempre più alti. Se per la risposta prendiamo in esame la migliore immagine possibile - da una serie di foto da me scattate in analogico e in bianco e nero a Pistoia nel marzo 1985 - si potrebbe affermare che siamo a un risultato vicino a 100 [fig. 15].



Figura 15 Pistoia, marzo 1985. Foto originale; colorazione DeOldify. Proprietà ed elaborazione dell'Autore

36 Nel 2015 sono state colorate manualmente da una società specializzata nel restauro e appunto nella colorazione di foto storiche, in collaborazione con il National Geographic, le immagini scattate da Harry Burton all'apertura della tomba di Tutankhamon nel 1922: https://www.storicang.it/a/alla-scoperta-della-tomba-di-tutankhamon_14607.

37 <http://www.archaide.eu/>.

Senza eccedere, ovvero su alcune centinaia di immagini processate scegliere il risultato ottimale, in un quadro più generale - sulla base delle prove condotte, con diversi algoritmi a partire da alcuni rilasciati dal 2016 sino ai più aggiornati del 2021 - è possibile affermare che la colorazione automatica sia una tecnica promettente, applicabile nei campi indicati (e anche in altri possibili), ma che risente ancora di una mancata quanto necessaria specializzazione. La procedura è utilizzabile con risultati positivi - processando magari per grandi corpus di immagini per ottimizzare i risultati con una sorta di ridondanza - ponendo tuttavia attenzione ad alcuni aspetti. È necessario approfondire, con il confronto di immagini colorate manualmente o illustrazioni, il contesto delle fotografie originali, procedendo poi a un'analisi comparativa dei risultati, indirizzati sia a una calibrazione dell'algoritmo, se il processo è sviluppato in autonomia, sia valutando caso per caso e introducendo la possibilità di una lieve postproduzione delle foto risultanti. Abbiamo osservato che Antic, algoritmo che restituisce risultati ragionevoli, ha limiti con lo spettro del rosso, che diventa il colore dominante in alcune parti dell'immagine, come nell'abbigliamento, aspetto legato a una non corretta interpretazione del supporto ortocromatico, cieco al rosso. In questo caso, considerandolo un errore noto, è possibile intervenire con una successiva elaborazione che sulla base di indicazioni rilevate ad esempio da illustrazioni è in grado di attribuire a quel rosso un colore corretto. Il progetto *Time-Travel Rephotography* rappresenta un'evoluzione con la quale è necessario un confronto, sia nello sviluppo di nuovi algoritmi sia in senso più generale anche nell'ambito dell'uso della memoria, perché, seppur limitato alla figura umana, evidenzia come la colorazione automatica possa porsi nella ricostruzione della realtà storica in modo molto avanzato, dal quale non possono essere esenti errori di interpretazione se non si hanno chiare anche le metodologie e non solo le finalità.

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What is the Public of Public History? Between the Public Sphere and Public Agency

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Abstract Public history constitutes a historical field, it includes several related journals, membership organisations, research centres, undergraduate and graduate programs all over the world. Most importantly, Public History has been marked by growing historiography and an increasing public interest in history. However, there is a lack of research on the most important constituent element of Public History, the 'public'. The aim of this paper is to shed light on how Public History has approached the public in the last four decades. By focusing on the two different forms the public has taken, the public sphere and the public agency, the paper examines the notion of the public as it appeared in the historiography and how it determined the epistemology and methodology of Public History.

Keywords Public History. Public. Public sphere. Public agency. Historiography of Public History.

Summary 1 Introduction. – 2 The Public Before Public History. – 3 From Applied to Public History: Defining the Public. – 4 Between the Public and the Public Sphere. – 5 Conclusion: Future Orientations for the Studying of the Public.



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1 Introduction

In the last four decades, Public History has been institutionalised as a historical field. Public history includes its main journal, *The Public Historian*, which was published in 1978, its membership organisation, the National Council on Public History, which was created in 1980, its global membership organisation, the International Federation for Public History established in 2010, and Public History graduate programmes in several countries across the world.¹ However, the most important developments, which are essential for the field, are the growing historiography of Public History and the increasing public interest in history.²

The aim of this paper is to explore the historiography of Public History by focusing on the concept of the 'public', as it appeared in the historiographical production and debates of the United States. Since the seventies, several historians, philosophers, practitioners, archivists, preservationists, and social scientists have tried to define the public and its relationship to historical production. The conceptual idea of the public determines the epistemology of the field, so an exploration of its development over time is significant not only for the state of the field but mainly for future orientations. The public is not one single thing but takes different forms according to the approaches that historians follow and the broader political, social, and cultural context of the period. In the historiography of public historiography, the public has taken two forms, the public as individuals and the public as a public sphere. Before focusing on these two different approaches, I explore the concept of the public as it appeared, to which other concepts it was related, and how it determined Public History. My central argument is that in the historiography of Public History there are two main approaches of studying the public, one approach that focuses on the public itself and how it engages with history, and another that focuses on the public sphere. However, as I will show in this paper, there is a tendency of historians to approach the public by paying more attention to the public sphere instead of the public itself.³

I would like to thank Professor Tammy Gordon for her thoughtful comments on my paper and our fruitful discussions on the historiography of Public History.

¹ See Greenberg 1998, 296; Conard 2003, 11; Meringolo 2012, xiv; Cauvin 2018, 3-26.

² Regarding the increasing interest of the public in history, see Rosenzweig, Thelen 1998; Groot 2009; Landsberg 2015; Groot 2015, 102-27.

³ I want to clarify that I have not been able to include this forthcoming book in my study, which focuses on the public(s) and its role in Public History, see Wojdon, Wiśniewska 2021.

2 The Public Before Public History

Almost every study on Public History traces the roots of the field and the connection between history and the public to the article of Carl Becker, "Everyman His Own Historian" published in 1932. Becker, an American academic historian, saw the connection between historical knowledge and public audience in a radical way. He defined history as "the knowledge of the events that have occurred in the past" (222). However, he claimed that this kind of knowledge is not only placed in the archives, historical records, and documents of the past, as the dominant historiographical paradigm of the nineteenth and early twentieth century argued.⁴ Instead, for Becker, historical knowledge has several characteristics and one of the most important is memory. Thus, history becomes "the memory of events that have occurred in the past" (222). He also clarified that historical events are not only the grand and spectacular events of history (222). In addition to that, Becker argued that "history is the memory of things said and done", and it does not refer only to the distant past (223). That perception of history constituted a significant discontinuity from Leopold von Ranke's view of history, which characterised historical studies in the nineteenth century.⁵ For Ranke, historians had to look for the "particular", which exists in the historical archival sources (Iggers 2002, 237).⁶

Becker opened up history by enabling the public to engage with the past and, more precisely, to be part of the past through its memories. He challenged the nineteenth century paradigm that, as Georg Iggers wrote, made a distinction between history as a science practiced by professional historians and history as a literary activity practiced by amateurs (2002, 232). However, Becker did not use the term 'public', but the term 'Mr. Everyman' to signify that anyone makes sense of the past, otherwise they will not be able to understand the present and the future (1932, 223). His choice to use the term 'Mr. Everyman' signified an acceptance of the gendered and male-centric language of the period, however he saw history-making as a more democratic process.⁷ According to Becker, the only difference between historians and Mr. Everyman is that Mr. Everyman is inter-

⁴ I refer here to Leopold von Ranke's view of history as what happened in the past and his belief in the objectivity of historical knowledge. For more information on the historiography of historical studies, see Iggers 2002, 225-42.

⁵ For the historiographical contribution of Leopold von Ranke to the historical studies, see Ranke 2010.

⁶ For a discussion on Public History and Ranke's view of history, see Storey 1992, 11-22.

⁷ In his presidential address, William Cronon mentioned the gendered language of Carl Becker (see Cronon 2013).

ested in learning about events of the past related to his personal affairs (234). Therefore, Becker suggested historians to pay attention to Mr. Everyman, otherwise, as Becker argued,

he will leave us to our own devices, leave us it may be to cultivate a species of dry professional arrogance growing out of the thin soil of antiquarian research. Such research, valuable not in itself but for some ulterior purpose, will be of little import except in so far as it is transmuted into common knowledge. (234)

In other words, the stories of the public should not be neglected but have a place in history, as the public engages with the past actively in the everyday life.

However, Carl Becker's arguments about historical knowledge remained marginal for the next decades and there were not works that engaged with the concept of public. At an important extent, in the thirties, the historians of the French journal *Annales*, such as Lucien Febvre and Marc Bloch, started to develop a similar view of historical knowledge by expanding history to include broader groups of the population (Iggers 2002, 237).⁸ However, the focus of *Annales* school was not the public itself but the broader social processes and structures (237).⁹

In the sixties, while there was a broader democratisation of political institutions in the western world and more social groups were entering in the public sphere, the German philosopher Jürgen Habermas published the book *The Structural Transformation of the Public Sphere. An Inquiry into a Category of Bourgeois Society*. Habermas explored the terms 'public' and 'public sphere', and how these concepts changed from the seventeenth to the mid-twentieth century by focusing on the bourgeois culture (1991, 1). While most social scientists were defining the public as a 'state institution' or 'public authority', or 'public reception', Habermas defined it as "a carrier of public opinion" (2). In the mid-twentieth century, the public sphere signified a public domain of action versus the private domain (2). The main argument of Habermas, as the sociologist Craig Calhoun wrote, was that the bourgeois public sphere signified a public sphere of private individuals, who were participating in a debate of issues under the state authority (1996, 7).

The book of Habermas constituted one of the first works on the public and public sphere. His study has been perceived with both

⁸ For some works of Lucien Febvre and Marc Bloch, representative of *Annales* school, see Febvre 1985; Bloch 1966; 2014.

⁹ This does not mean that Public History as it was institutionalised in the seventies was not influenced by the *Annales* school of historical thought. My point is that the public was neither the subject nor the object of their studies. For more information of the *Annales* school of historical thought, see Burke 1990; Iggers 1997.

enthusiasm and criticism by several social scientists.¹⁰ It is interesting that most of those scholars were philosophers, sociologists, media, and communication scholars, while historians were absent from these discussions. Habermas brought the public sphere into the discussion as a social area, where individuals exchange opinions and develop political actions. Habermas managed to go beyond the Frankfurt school's focus on the proletariat as a vehicle for the societal transformation and focused on "the intersubjective communicative processes of bourgeois", as Calhoun has mentioned (1996, 5-6).

3 From Applied to Public History: Defining the Public

In 1978, in the first issue of *The Public Historian*, the historian Robert Kelley introduced the term "public" by arguing that "public historians are at work whenever, in their professional capacity, they are part of the public process" (Kelley 1978, 16 cited in Conard 2003, 11). This issue signified the emergence of a new field of history. However, the use of the term 'public' was novel during that time and aimed to replace the older term of 'applied history' (Conard 2003, 11). In the next issues of the journal, as Rebecca Conard wrote, several historians looked back at the term "applied history", which was introduced by Benjamin Shambaugh in 1909 and represented a product of a more scientific history (Conard 2003, 12). According to Shambaugh, 'applied history' was based on New History and signified discipline and objectivity in the method of historical research and aimed to make history useful (Conard 2003, 12). Thus, a debate among historians if they will use the term 'Public History' or 'applied history' started.

As Rebecca Conard wrote, many historians were against the term 'applied', as the historians who were working outside academy did not apply the theories of historical scholarship (2003, 13). They neither wanted to use the term 'applied' nor to follow a positivist view of history. Their argument was that history cannot become a hard science and integrate a "technical rationality" (13). People cannot use history to solve problems or predict the future (13). Also, the term 'applied history' was not compatible with the professional identity of historians during that time, which was strongly connected to the practices of researching, writing, and teaching (14). The term 'applied history' was based on the "practice of history" while the term Public History responded to the "study of history" (14). Another aspect of the transition from the 'applied' to the 'public' history is the broader historiographical developments of new social history, histo-

¹⁰ See for example, Fraser 1990, 56-80; Cossley, Roberts 2004; Goode 2005; McKee 2005.

ry from below, bottom-up history that had taken place in the sixties (Cauvin 2018, 8).¹¹ Even if these historiographical trends were more dominant in Europe than in the US, they created a framework of discussion and influenced several historians in the western countries (Cauvin 2018, 8; Conard 2018, 30).

However, the domination of the ‘public’ over the ‘applied’ signified the creation of an epistemological framework for the field and took place through several historiographical discussions and publications. Many public historians, local historians, practitioners, archivists, preservationists, begun to discuss what Public History is, what the characteristics of Public History are, how it differs from academic history, what it aims to do, and how the public is related to the production of historical knowledge.¹² These discussions defined the methodology and the research interests of the field and its future orientations.

In that framework, Ronald Grele, an oral historian, and a former Director at the Oral History Program at UCLA, published the article “Whose Public? Whose History? What is the Goal of a Public Historian?” in *The Public Historian* in 1981. He pointed out that if we want to understand what Public History is and does, we should explore what the public is, as there is not much research on the public (41). Grele argued that historians always had a public, and history was always a public act. The point is how the public changed over times (41).

For Grele, Public History has three main elements: 1) the education of graduate student for jobs as archivists, museum directors, preservationists etc. This means that Public History attracted academy, as Public History could offer job opportunities (45). 2) Public History becomes more professional and acquires academic characteristics (45). For Grele, this is a negative characteristic, as the Public History movement follows a very narrow definition of what it is, very similar to the view of professionalism by the academy (46). The reason for that is that the Public History movement has ignored all those debates that took place in the sixties, so Public History has seen itself as just a profession and not as “a vocation-a calling”, which was important characteristic of the local history movement in the sixties (46). 3) many public historians work as government advisers or employees, namely professions, which were not important for historians. Their older view of historical profession was not that narrow. They did not aim to work for those who rule and have the instruments of social power (46). Of course, some historians did that in the past, but they did not identify their profession as doing only that (47). Thus,

¹¹ Regarding the historiographical developments of new social history and cultural history between the sixties and the eighties, see Reddy 2002.

¹² Regarding the institutionalisation of Public History, see the following studies, Conard 2015; 2003; Cauvin 2018.

all the efforts of Public History have been related to the governmental world. In that way, for Grele the public of Public History has become just one public, among others. Public history should think the community work as an important historical work (47). Grele closed his article by arguing that the public redefines the role of the historians and promises "a society in which a broad public participates in the construction of its own history" (48).

The discussions about the epistemology of Public History continued and the definition of the public took different directions. In the same year, the urban and oral historian Michael Frisch published the article "The Memory of History", in which he discussed the relationship between memory and history to show how a different view of the past can create the potential for a different future (1981). His argument was that there is more emphasis in the 'how' rather than the 'why' in Public History (9). Regarding the 'why', Frisch argued that most of the works in Public History point out the need to encourage a wider sharing of knowledge, a broader participation in the history-making, a challenge to conventional scholarship (9). For Frisch, the central issue for public historians is to examine the relationship between history and memory, both collective and individual (9). He suggested historians to remove Public History from "the circle of demand and supply", and focus on the relation between memory and history, which can enhance our ability to imagine and create a different future (10).

Overall, Frisch followed Carl Becker's suggestions for the importance of memory in the production of historical knowledge and pointed out that Public History cannot be public if it is not strongly connected to memory. For that reason, even if a memory is historical or ahistorical, public historians should activate the process of remembering and make the public able to encounter "the sense of their own past" (22). Regarding the 'how' of Public History, Frisch developed a methodology of doing Public History in his book, *A Shared Authority*, published some years later (1990).¹³ He connected oral and Public History for the study of memory through the concept of shared authority (1990, xx). That method can challenge the historical authority. As Frisch argued, this authority "might be shared more broadly in historical research and communication rather than continuing to serve as an instrument of power and hierarchy" (xx). Public historians should not regard the public as not able to communicate its histories outside its own immediate experience and knowledge (xxi). Instead, public historians should understand that their methods can do more than just extract the knowledge from the people, and they

¹³ Frisch has also analysed "shared authority" in other works. For a more contemporary view of "shared authority" in the digital age, see Frisch 2011.

should also realise that they can do more than just communicate the historical knowledge (xxii). For Frisch, public historians should create a space of collaboration between themselves and the narrators (xxii; see Cauvin 2018, 8).

Grele and Frisch, the first theorists of Public History, underlined the active role that the public – the individuals – should have to produce historical knowledge. Both scholars were influenced by earlier discussions in oral history, which had started in the thirties in the US but developed all over the world in the sixties (Cauvin 2018, 8). Oral history placed marginal social groups, communities, and individuals at the centre of the historical study. The method of oral history created terms, such as collective memory, which showed that history is mediated by the narrators' collective memories (8). Thus, the theories of Grele and Frisch, and more specifically the concept of shared authority, signified the collaborative relationship between the historian and the narrator to produce history and created a bridge between oral history and Public History (8).

Following the same line of thinking, the historian Douglas Greenberg discussed Public History and its function to communicate historical knowledge to a broader public (1998). His main point was that many historians have failed to communicate historical knowledge to a broader public (297). As he wrote, historians have rarely thought about their social responsibilities and their role in the society. At the same time, many historians ignore or diminish historians, who try to communicate their historical knowledge (297). The danger of that logic is that history will become a “luxury” (298). For Greenberg, the concept of public does not mean that historians should produce the historical knowledge that the audience wants and stop studying the “useless knowledge” (308-9). Instead, both academic and public historians should understand that there is a public audience “hungry for more and better history” (308-9).

All those studies placed the public at the forefront of Public History and defined Public History according to the agency of the public. These theories represented a broader transition from public historians who practised history and worked for governments, historical societies, and archives between the mid-nineteenth and the mid-twentieth centuries, to public historians who wanted to create a shared authority with the public and communicate history to a broader audience.¹⁴ Presenting history and studying the public's use of history became more important than applying history (Cauvin 2018, 18; Knevel 2009, 8). These conceptual ideas determined the field of Public History and shaped its works in the following decades.

¹⁴ For a genealogy of Public History between the mid-nineteenth and the twentieth centuries, see Meringolo 2012.

4 Between the Public and the Public Sphere

In the historiography of public historiography, the public has taken two forms: individuals and the broader context in which the public acts, the public sphere. It is difficult to discern these two forms according to chronological periods, as there is not a transition from one form to the other. Instead, they coexist and constitute the two major approaches to do Public History. This section is not a complete historiographical overview of Public History works that engage with the public. I refer only to works that represent broader patterns and methods of approaching the public.

In 1998, Roy Rosenzweig and David Thelen, published one of the most influential works for Public History, *The Presence of the Past: Popular Uses of History in American Life*. The two historians followed the method of survey and explored what Americans did know and think about the past, but also how they understand the past. Their study was based on the assumption that, even though it is widely believed that Americans do not know about the past, there is a growing public interest in history (3). They did not study how the past is represented in popular and public culture, but how the past is understood by people (4). Their findings challenged the common belief that Americans do not care about the past. They showed that Americans are interested in the past but not in history as it was defined in academic textbooks (9). For example, most of the interviewees felt strongly connected with the past at family meetings (177). Thus, by focusing on the public itself, the two historians showed that the public looks for a past that can respond to what Carl Becker called "the necessities" of the present (178).

In Rosenzweig and Thelen's study, the agency of the public and its approach to the past was attached to two important concepts, "historical consciousness" and "historical memory" (3). The former term signified the public understanding of the past as it is defined by the experiences, interests of individuals. The latter was borrowed from Carl Becker's and Michael Frisch's works on the active process of remembering, which determined the perception of the past and the production of history. Both concepts offered two different approaches of how the public as 'history makers' actively engages with the past, while the book constituted a novel example of how historians can place the public at the centre of historical inquiry (Glassberg 2001, xiii).

Following a similar line of thinking, David Glassberg explored how Americans have understood and used the past in the twentieth century (xiii). He followed a distinction between the "interpretation of history" that professional historians do and the "sense of history" that the public has. The sense of history is a "perspective on the past at the core of who they are and the people and the places they care about" (6). Glassberg's work did not follow the approach of Rosenz-

weig and Thelen's study, as Glassberg focused on the public perception of the past through war memorials, festivals, places, historical documentaries etc. and not on how people themselves understand and think about the past.

However, the next works of Public History that appeared focused more on the 'historical memory' of the public and ignored the active agency of the public in history making. More specifically, in her book, *Prosthetic Memory: The Transformation of American Remembrance in the Age of Mass Culture*, the historian Alison Landsberg explored how memory has changed in the transition from modernity to post-modernity (2004). Landsberg showed that memories do not belong to only one group, but through the technology of mass culture memories can be acquired by anyone (2). These are "prosthetic memories", memories that "emerge at the interface between a person and a historical narrative about the past, at an experiential site such as movie theater or a museum" (2). Landsberg used those spaces as public spheres, in which individuals become part of a broader and larger story, even they did not live during that period. As she mentioned:

[t]he person does not simply apprehend a historical narrative but takes on more personal, deeply felt memory of a past event through which he or she did not live. (2)

Even if her useful concept of "prosthetic memory" implied an active dialogue between individuals and the past, the scope of her study is not how individuals perceived the movies or the novels or the museum exhibitions, how they engaged with them, and what historical understandings they made. Instead, the public seemed dominated by the affective structures of the public sphere.

Memory remained a dominant subject of Public History. In her book, *The Emotional Life of Contemporary Public Memorials*, Erika Doss theoretically explored the contemporary memorialisation (2008). She explained why in the last years, there is an explosion of public monument-making in the US and Europe, but also a broader shift from monuments to memorials (5). The memory boom covers several cultural practices, such as artifacts, national narratives, from family reunions and scrapbook photographs to annual civic celebrations and aims to give voices and visibility to more and more social groups after their death (35). Memory is performative and experiential (35). Her main argument is that

today's 'memory boom' reflects less, then, a declension of historical consciousness than a cultural shift toward public feeling, toward affective modes of knowledge and comprehension. (37)

Her study is very interesting as she attached an emotionality to the public sphere and challenged Habermas's theory of public sphere as a place, where sensible citizens exchange ideas and unite in progressive actions (12). Instead, she argued that public life has emotional conditions, which mobilise and manipulate people on several debates (23).¹⁵ However, in her study, the public appeared as a passive receptor of cultural changes that have given rise to memorials and the emotionality of the public sphere.

Important components of the public sphere have always been museums, historical, and heritage sites. In the historiography of Public History, several works have shed light on those public spaces.¹⁶ A representative example is the book of Seth Bruggeman, *Here, George Washington Was Born* (2008). Bruggeman explored the history of Washington's birthplace during the nineteenth and twentieth centuries and contextualised all the changes that took place in the historical site mentioning broader social, political, cultural, and intellectual developments. He referred to the explosion of popular patriotic symbols after the War of 1812, the archaeological excavations that questioned the authenticity of Washington's birthplace, the Cold War, and the use of the past against 'threats' to American democracy, the popularisation of history as a living experience in the seventies, the race and gender interpretations (20-3). The most interesting point of the book is the desire of people to encounter historic objects, even if they are not authentic. However, Bruggeman studied this strong desire for immersion in the past to reveal the ahistorical associations the public make and not to show how people perceived the past or responded to it and why they developed these connections with the past. Bruggeman's work reveals a broader tendency in the historiography of Public History to focus on the history of public institutions and skip the public experiences of visitors, who visit those institutions and engage with them.

A landmark study in the historiography of Public History is the book *Consuming History. Historians and Heritage in Contemporary Popular Culture* (2009), in which the literature and Public History scholar Jerome de Groot connected public and popular history, and explored how the past is represented in public/popular forms of engagement (93-8). Groot studied several Public History activities, such as local history, genealogy, digital archives, encyclopedias, and websites, historical reenactment, historical video games, historical films,

¹⁵ The work of Erica Doss is strongly influenced by the 'affective turn' in the historiography, which started in the mid-nineties, see Rosenwein 2002; 2006; Plamper 2010. For the term 'affective turn', see Clough, Halley 2007; Athanasiou, Hantzoulaki, Yannakopoulos 2008, 5-16.

¹⁶ See Linenthal 1995; Stanton 2006; Upton 2015; Roger 2015; Sodaro 2018.

TV shows, novels, plays, comics, and museums. As the title of the book reveals, his research scope focused on popular and public forms of historical engagement that the public ‘consumes’. Individuals and social groups appeared as ‘consumers’ of the past and not as active participants in the historical engagement with the past or producers of historical knowledge.

Following a similar approach, the study of Erika Doss *Memorial Mania: Public Feeling in America* examined several statues, monuments, and memorials in the US and how modern America’s obsession with commemoration developed and why it is so common today (2010, 13-15). For her, memorial mania is

an obsession with issues of memory and history and an urgent desire to express and claim those issues in visibly public contexts. (2)

Memorial mania is shaped by the conditions of public feeling in America, such as grief, gratitude, fear, shame, and anger (2). Erika Doss offered a great analysis on how memorials and other commemorative practices shape the public sphere. However, it would be interesting to show how the public expresses its emotions, how it codifies the past, perceives the memorials, and even more importantly, why the public has “obsession with issues of memory and history” (2).

A different approach to the study of the public and the public sphere is developed in the work of the historian, Tammy Gordon, *Private History in Public. Exhibition and the Settings of Everyday Life* (2010). Tammy Gordon focused on the exhibitions of small private museums, which displayed artifacts and history in a local context (4). She conducted several interviews with visitors and curators of the exhibits (10-11). In that way, she created a dialogue between the public sphere of small museum communities, which also included bars, restaurants, truck shops, schools, barbershops, and churches, and the people, who told and displayed their stories (5). In these stories, she detected their personal experiences, feelings, beliefs, and memories (5). Her approach to the public showed that both visitors and curators are important agents and determine the production of historical knowledge. In her work, both the public sphere (small private museums) and the public interact and shape public engagement with the past.

The public was placed at the centre of historical inquiry in the work of Benjamin Filene, “Passionate Histories: ‘Outsider’ History-Makers and What They Teach Us” (2012). Filene explored how the individuals, who work outside museums and universities without professional training and often without funding, approach history in a way that causes the interest of thousands (11). Those “outsider history-makers” (genealogists, reenactors, heritage tourism developers), as Filene called them, create passionate histories, and view the past not as an intellectual process but as a living and emotional resource

(11). For Filene, the public is not only an active producer of the past, but its interests and methods can constitute models for museums, historic sites, and other institutions.

The public gets a more diverse character in the study of Tammy Gordon, *The Spirit of 1976. Commerce, Community, and the Politics of Commemoration* (2013). Gordon explored the 200th anniversary of the American Revolution by focusing on social history, consumerism, distrust of federal government, cold war consensus, and individuality (3). According to Gordon, we cannot understand the collective, if we consider the public as one single thing. The public of 1976 was made of individuals who were promoting their geographical, religious, ethnic, and professional interests and based on those interests were making their own interpretations of the past. The crucial point here is that, focusing on the public, Gordon pointed out that consumerism did not homogenise the public, as many individuals criticised, but it gave individuals the tools to tell their stories and give meaning to the past (5-7). As Gordon mentioned, Americans were not passive receptors of what they were told, but they were

active participants, individuals with unique combinations of interests, looking for relevance in the birth of their country. (5)

The public is not one single thing. The public are the African Americans, women, American Indians, workers, and young people, who used the bicentennial to integrate their histories into the national narrative (4).

The contemporary mass-mediated public sphere has been the subject of Alison Landsberg's work, *Engaging the Past. Mass Culture and the Production of Historical Knowledge* (2015). She explored the consequences of prosthetic memories for what is history and how we have access to historical knowledge in the contemporary, mass-mediated public sphere (3). Landsberg focused on the popular modes of engagement with the past and examined the relationship between structures of looking and feeling, and contemporary ways of knowledge collection and production (3). Her main argument was that in the mass-mediated public sphere the production of history is based on the mobilisation of affect (178).

Following a similar line of thinking, the historian Małgorzata Rym-sza-Pawlowska used examples from popular culture to show that by the seventies Americans were more interested in the past than in the present or future (2017, 2). Rym-sza-Pawlowska showed that in the seventies there was a transition from a distant and instructive past to a more affective and personal past (2). She focused on public forms of engagement, such as TV shows, commemorations, museums, exhibitions, reenactments that shape the "historical consciousness" of the public (12). All these popular and public forms are not

just representations of the past but emotional and personal modes of historical engagement (2). The public seems trapped in a public sphere, where it consumes movies, tv series, museums, exhibitions without negotiating with them.

5 Conclusion: Future Orientations for the Studying of the Public

As shown above, there are two main approaches to the studying of the public. The studies that focus on the public itself and how the public consumes and engages with history and those that focus on the public sphere, on how institutions, popular forms of history or engagements with the past produce historical knowledge. Over the last three decades, there is not a transition from one approach to the other. Instead, they coexist and have developed the field of Public History at a great extent. However, most studies have focused on the public sphere (museums, historical sites, exhibits, movies, TV shows, commemorations etc.) and not on the active role of the public in its encounter with the past. The public is not absent from that discussion, but it is trapped in the structures of the public sphere. The public consumes and not produces history.

This is not a new argument, as since the early eighties Michael Frisch and Ronald Grele have showed the importance of a dialogue between historians and the public. Even earlier, Carl Backer underlined how significant it is for historians to study how Mr. Everyman makes sense of the past. Katharine Corbett and Howard Miller have also highlighted this lack of study on the agency of the public by arguing that public historians have done more history for the public instead of doing history with the public (2006, 36). As Corbett and Miller have mentioned, public historians have made little effort to share inquiry and authority with the public (36).

A transition from the public as an object of history to the public as a subject of history is more than necessary. By doing that, a new research era of Public History will emerge. If public historians realise that both professional historians and non-historians shape historical meaning together, they will better understand how the public perceives the past and why it engages with it. The public will no longer be a single homogenised unity, but it will reveal its characteristics. As the public historian David Dean has put it, the public will become “publics”.¹⁷ In that way, public historians will be able to detect relations of power, and political, social, and cultural characteristics, such as class, gender, race, education that shape the “publics”. Pub-

¹⁷ See the chapter of David Dean on the use of “publics” instead of public (2018).

lic historians should turn their attention to a contemporary version of Becker's Mr. Everyman by bringing up its agency and diversity.

As the historiography of Public History shows, public historians should develop a dialogue between public sphere and public agency, instead of examining them separately. Therefore, public historians will develop a better understanding of how the historical consciousness of the public is formed and what factors enable or restrict the public to produce, consume, and negotiate with historical knowledge. The call for a dialogue between public sphere and public agency can be more feasible during the digital age.¹⁸ Digital technologies provide the public with opportunities for both consumption and production of history. Several digital projects and platforms enable the public to explore the past, share its memories about the past, decodify the it, take part in discussions and debates about history, and contribute to the production of historical knowledge. Public history should be the field that will critically study these opportunities, beyond simplistic and naïve celebrations about openness and democratic participation. Public historians should focus on the agency of the public without ignoring the framework, in which this agency takes place.

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¹⁸ For example, see the participation of the public in digital genealogy platforms (Groot 2015). Also, digital technologies offer new ways of doing Public History and sharing authority with the public (see Frisch 2011).

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